THE REVIEW

OF

APPLIED MYCOLOGY

Vol. XV

ISSUED BY THE IMPERIAL
MYCOLOGICAL INSTITUTE

THE IMPERIAL MYCOLOGICAL INSTITUTE
KEW, SURREY

1936

IMPERIAL MYCOLOGICAL INSTITUTE

EXECUTIVE COUNCIL

Sir CHARLES J. HOWELL THOMAS, K.C.B., K.C.M.G., *Chairman*, United Kingdom

NEVILL L. WRIGHT, F.I.C., *Vice-Chairman*, New Zealand

Lt.-Colonel GEORGE P. VANIER, D.S.O., M.C., Canada

F. L. MCDOUGALL, C.M.G., Australia

F. J. DU TOIT, South Africa

J. M. ADAMS, F.R.C.Sc., Irish Free State

Sir FIROZ KHAN NOON, India

B. F. WRIGHT, Southern Rhodesia

R. V. VERNON, C.B., Colonies, Protectorates, and Mandated Territories

Secretary: Sir DAVID CHADWICK, C.S.I., C.I.E.

STAFF

Director

S. F. ASHBY, B.Sc.

Assistant Director and Editor

S. P. WILTSHIRE, M.A., D.Sc.

Mycologist

E. W. MASON, M.A., M.Sc.

Assistant Mycologist and Sub-Editor

H. A. DADE, A.R.C.S.

PRINTED IN GREAT BRITAIN AT THE UNIVERSITY PRESS, OXFORD
BY JOHN JOHNSON, PRINTER TO THE UNIVERSITY

ERRATA

Page	26	line 15	for 'Michaelis (F.)'	read 'Michaelis (P.)'
		46	„ '*1935*'	„ '*1934*'
	27	22	„ '*1935*'	„ '*1934*'
	55	31	„ '*1935*'	„ '*1934*'
	56	18	„ '*1935*'	„ '*1934*'
	57	19	„ '*philippensis*'	„ '*philippinensis*'
	64	43	„ '*Casimoroa*'	„ '*Casimiroa*'
	76	28	„ 'anarca'	„ 'anauca'
	93	32	„ '*ballagi*'	„ '*ballagii*'
	159	21	„ '*laxi*'	„ '*laxa*'
	160	37	„ 'Maclachan'	„ 'MacLachlan'
	164	33	„ 'sulphide'	„ 'disulphide'
	216	19	„ '*Locusta migratoria migratorioides*'	„ '*Nomadacrisseptemfasciata*'
		20	„ 'Massa'	„ 'Niassa'
	257	5	„ '*koningii*'	„ '*koningi*'
	264	28	„ '25 to 27'	„ '17 to 25'
	346	9	„ '*vasculorum*'	„ '*albilineans*'
		10	delete 'West'	
	394	36	for '10'	„ '109'
	400	7	„ '*Garya*'	„ '*Garrya*'
	444	21	„ 'xiv'	„ 'xiii'
	482	32	„ 'mosami'	„ 'mosambi'
	486	4	„ 'arsenic'	„ 'arsenite'
	488	31	„ 'Johnston'	„ 'Johnson'
	531	1	„ 'xv'	„ 'vii'
	550	16	„ 'Gardner (W. M.)'	„ 'Gardner (M. W.)'
	555	10	„ 'or'	„ 'in'
		39	„ '*G. album*'	„ '*Glocosporium album*'
	561	33	„ '*Agron.*'	„ '*Agric.*'
	579	19	„ 'Dey (W. C.)'	„ 'Dey (N. C.)'
	617	7	„ '*Blepharosphora*'	„ '*Blepharospora*'
	672	44	delete '*calceolaria*'	
	725	28	for 'xv'	„ 'xiv'
	775	13	„ '*P.*'	„ '*Phytophthora*'
	793	41	„ 'Edwards (E. J.)'	„ 'Edwards (E. T.)'
	808	41	insert '*P. cinnamomi*:' before '*R.A.M.*'	

IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW

OF

APPLIED MYCOLOGY

VOL. XV JANUARY 1936

NEUWEILER (E.). **Bericht über die Tätigkeit der Eidg. Landwirtschaftlichen Versuchsanstalt Zürich-Oerlikon für die Jahre 1932 und 1933–34. IV. Pflanzenschutz.** [Report on the work of the Federal Agricultural Experiment Station Oerlikon (Zürich) for the years 1932 and 1933–34. IV. Plant Protection.]—*Landw. Jb. Schweiz*, xlix, 5, pp. 557–562, 1935.

Wheat bunt [*Tilletia caries*] at Oerlikon, Zürich, was practically eliminated in 1932 and 1933–4 by treatment of the seed-grain with U. 564 [*R.A.M.*, xiii, p. 627] by the immersion and sprinkling methods, this preparation being unsuitable, however, for the short disinfection process. Helion [ibid., xiii, p. 11] failed to give adequate control. V. Casaburi (Naples) recommends the use of the following dusts at the rate of 2 kg. per 100 kg. seed-grain: iron salt BB (iron salt of a synthetic tannin with minute amounts of mercury, copper, and arsenic), dea (iron salt BB+paradichlor emulsion+talc and moisture), unitan (mercury salt BB+paradichlor emulsion+talc and moisture), and unidea (a blend of dea and unitan in the ratio of 1:1) [ibid., xiv, p. 114], but none of these was found to equal formalin either in bunt control or for stimulatory purposes.

In potato spraying [against *Phytophthora infestans*] in 1933–4 the yield was increased by 19·3, 23, 29, and 29 per cent., respectively, by treatment with cusisa [ibid., xiii, p. 11], Ob. 21 (Farbenindustrie, Leverkusen), cupro-maag [ibid., xiv, p. 701], and kukaka [ibid., xi, p. 694] as compared with 41 per cent. for home-made Bordeaux mixture.

Encouraging results in the control of heart and root rot of beets [ibid., xiv, p. 808] were obtained by the application of borax to the soil at the rate of 6 kg. per hect.

GALLOWAY (L. D.). **India: new plant diseases recorded in 1934.**—*Int. Bull. Pl. Prot.*, ix, 8, pp. 176–178; 11, p. 268, 1935.

Among other new phytopathological records collected in India during 1934 by the Imperial and Provincial Mycologists were a foot rot of sugar-cane seedlings caused by *Helminthosporium* sp. and stinking rot of the same host due to *Bacterium pyocyaneum* var. *saccharum* Desai, *Sclerotinia sclerotiorum* on maize, *Endothia* sp. on chestnut (*Castanea vulgaris*) (all at Pusa); mosaic of *Elettaria cardamomum*, controllable by

propagation through seed, foot rot of rice (*Fusarium moniliforme* var. *majus*) [*Gibberella fujikuroi*: *R.A.M.*, xiii, p. 323; xiv, pp. 254, 709], and damping-off of tobacco seedlings (*Pythium aphanidermatum*) [ibid., xiv, p. 473] (all in Madras); greasy spot (black melanose), a physiological disease of citrus, and *Cercospora personata* and *C. arachidicola* on groundnuts [ibid., xiii, p. 747] (Central Provinces); *Diplodia* [*Botryodiplodia*] *theobromae* on *Aleurites fordii*, and *Oidium 'erysiphoides'* [ibid., vii, p. 538; viii, p. 424] on mango (Burma).

[Walters (E. A.).] **Report on the Agricultural Department, St. Lucia, 1934.**—45 pp., 1935.

In the section of this report dealing with plant diseases (pp. 16–19) it is stated that during 1934 red root of limes (*Sphaerostilbe repens*) [*R.A.M.*, xii, p. 21] was discovered in St. Lucia in the Soufrière district. A survey throughout the Island showed that scattered infection was present in practically all the older orchards, the fungus was actively parasitic in poorly drained and non-aerated localities where root damage from periodical floods was evident, and passively saprophytic in the drier orchards. The issue to growers of limes budded on the resistant sour orange [*Citrus aurantium* var. *bigaradia*] stock was therefore increased to allow of rapid replanting in the severely affected areas.

Owing to continued dry weather there was no serious loss during the year from wither-tip of limes [*Gloeosporium limetticolum*: ibid., xiv, p. 84].

Thirty-seven cases of coco-nut bud rots [*Phytophthora palmivora* or bacteria: ibid., xi, p. 27] and 16 of little leaf [loc. cit.] were recognized and treated.

Surveys in all the districts of St. Lucia have now revealed fairly accurately the extent and danger of Panama disease of bananas [*Fusarium oxysporum cubense*]. In general, the lowland areas and older cacao lands are infected, but the new clearings on forest lands are likely to remain disease-free for a long period, provided that the planting material used is properly inspected and the land selected carefully and systematically treated. The disease was present to the extent of 1·2 per cent. of the total area under banana cultivation in 1934 (903 acres), but only 0·3 per cent. of the new plantings (203 acres) were affected.

A tabulated schedule is also given showing the plant quarantine regulations in force in the Island. In 1934, 160 inspections of plant imports were made and 55 consignments were confiscated or otherwise dealt with.

Protecting plants from diseases.—*Rep. Wis. agric. Exp. Sta. 1933–1934* (*Bull.* 430), pp. 15–32, 3 figs., 1935.

Much of the information in this report has already been noticed from other sources. Promising results in the control of apple and pear scab [*Venturia inaequalis* and *V. pirina*] and cherry leaf spot [*Coccomyces hiemalis*: *R.A.M.*, xiv, pp. 544, 706] have been obtained by G. W. Keitt and D. H. Palmiter by the application, shortly before autumn defoliation, of various copper-lime-arsenite mixtures [ibid., xiv, p. 381], which largely prevented the development of ascospores in the overwintering leaves. Late dormant applications killed the perithecia of the organisms causing black knot of cherry [*Dibotryon morbosum*: ibid.,

xiv, p. 593] and spur blight of raspberry [*Didymella applanata*], and prevented the development of brown rot [*Sclerotinia fructicola*] conidia in fruits adhering to the trees after the previous year's infection. Used in dust form, copper-lime-arsenite proved somewhat more effective against wheat bunt [*Tilletia foetens*] than the copper carbonate and organic mercury preparations in common use.

Studies are in progress by A. J. Riker, J. G. Dickson, and R. O. Magie on the etiology of a destructive stalk rot of maize which is stated to be annually responsible for heavy losses. In 1934 the disease affected 89 per cent. of the plants in commercial stands, lodging being also observed in 20 per cent. of the cases.

Racine Market, a selection from Copenhagen Market cabbage resistant to yellows [*Fusarium conglutinans*] [ibid., xiv, p. 732], was extensively tested in Kansas and Wisconsin during 1934 and was generally approved by market-gardeners. The analysis by L. M. Blank and J. C. Walker of numerous progenies of the Wisconsin All Seasons cabbage revealed the occurrence of two types of resistance. Certain lines are completely resistant both in the field and in the greenhouse at a soil temperature of 75° F. The progenies of crosses between these and susceptible plants are also completely resistant (homozygous). Other lines are also entirely resistant in the field, but under greenhouse conditions a slight amount of disease appears in the progeny both from self-pollination and back-crossing.

Yellow dwarf of potatoes [ibid., xiv, pp. 147, and below, p. 42] was effectively combated by the use of certified seed [cf. ibid., xiv, p. 714]. Among the suggestions made by A. R. Albert, J. G. Milward, and J. C. Walker for the control of potato scab [*Actinomyces scabies*] are the use of the resistant Russet Rural and Russet Burbank varieties; the lapse of at least five years between liming and the next potato crop, with lucerne, maize, grain, and sweet clover [*Melilotus alba*] intervening; and seed disinfection.

K. Koch and J. Johnson found the mottle virus, which in combination with veinbanding produces rugose mosaic [ibid., xiv, p. 605], in potato samples imported from nine countries but in only about half of the 75 varieties represented.

MULLER (A. S.). **Brazil: some new diseases observed in the State of Minas Geraes in 1934.**—*Int. Bull. Pl. Prot.*, ix, 8, pp. 175–176, 1935.

The following are among the new phytopathological records collected during 1934 in Minas Geraes, Brazil: *Colletotrichum gloeosporioides* on *Averrhoa carambola*; *Corticium koleroga* [*R.A.M.*, xiv, p. 795] destroying a nursery bed of 10,000 coffee (*Coffea arabica*) seedlings at Herval; *Cercospora citrullina* on melon [ibid., x, p. 771]; and *Rhizoctonia* [*Corticium*] *solani* causing fruit rot of tomato [ibid., xiii, p. 349; xiv, p. 263] in rainy weather.

Enfermedades mas comunes de las plantas cultivadas. [Prevalent diseases of cultivated plants.]—Bulletin issued by Min. Hacienda Entre Rios, Dep. Agríc.-Gan., 35 pp., 7 col. pl., 1935.

Semi-popular notes are given on some well-known fungal and bacterial diseases of cultivated plants in the Argentine, with directions

for their control. In addition to the scientific designations of the pathogens, the names by which they are commonly known in the Argentine and abroad are given.

Burgwitz (G. K.). Фитопатогенные бактерии. [Phytopathogenic bacteria.]—252 pp., Издат. Акад. Наук СССР [Publ. Off. Acad. Sci. U.S.S.R.], Leningrad, 1935.

In its main part this monograph is a compilation from the literature of technical descriptions of phytopathogenic bacteria, with the indication of their hosts and geographic distribution. The author follows K. B. Lehmann's and R. O. Neumann's classification (*Bakteriologie*, ii [7th Ed., xi+876 pp., München, J. F. Lehmann], 1927) based on the morphology of the organisms, *Bacterium* including non-sporulating, straight or slightly curved but never sinuous, motile or non-motile rods, mainly Gram-negative, and *Bacillus* including sporulating, mainly Gram-positive rods with peritrichous flagella. The organisms are divided into three groups, the first comprising 184 species which have been studied more or less fully; the second, 26 species, the description of which is not yet complete; and the third, 81 species, the pathogenicity of which to plants has not yet been satisfactorily established. Bibliographical references are given after the account of the individual species, and the book terminates with an alphabetical list of all the species enumerated, with the indication of their authors and hosts, and a host index arranged according to the systematic position of the hosts, with a brief characterization of the diseases caused by the various pathogens.

Bact. maculicolum McCulloch, 1911, is regarded as being antedated by *Bact. maculicolum* (Delacroix, 1905) Stapp, 1928 [*B. maculicola* Delacr.—*C. r. Acad. Sci., Paris*, cxl, 1905], and is renamed *Bact. maccullochianum*. *B. vitis* Merjanian & Kovaleva, 1930 [*R.A.M.*, x, p. 772], is antedated by *B. vitis* Montemartini, 1913, and is renamed *B. viticola*. *B. papaveri* Christoff, 1932 [ibid., xiii, p. 307], is renamed *Bact. papaverum*, this specific name being preferred to avoid confusion with *B. papaveris* Ram Ayyar, 1927. *Bact. puerariae* [ibid., vii, p. 585] is cited as a synonym of *Bact. medicaginis* var. *phaseolicola*, *Bact. exitiosum* Gard. & Kend., 1921 of *Bact. vesicatorium* Doidge, 1920 [ibid., xiv, p. 681], and *Bact. viridifaciens* [ibid., iii, p. 124] of *Bact. vignae* [ibid., ii, p. 486].

Pugsley (A. T.), Oddie (T. H.), & Eddy (C. E.). **The action of X-rays on certain bacteria.**—*Proc. roy. Soc.*, Ser. B, cxviii, 808, pp. 276–298, 5 graphs, 1935.

The authors utilized *Phytomonas* [*Bacterium*] *medicaginis* var. *phaseolicola* [*R.A.M.*, xiv, p. 733] with *Bacillus coli* [ibid., xii, p. 426] and *Sarcina lutea* for an elaborate study on the action of X-rays on bacteria, the results of which are given in great detail. X-rays (0·25–2 Å) kill the three organisms in the following order of increasing sensitivity: *S. lutea*, *B. coli*, and *Bact. medicaginis* var. *phaseolicola*, the relative sensitivities being about 0·3, 1, and 3.

DUYFJES (H. G. P.). **Het problem der actieve immunisatie van planten tegen Pseudomonas tumefaciens Smith en Town.** [The problem of the active immunization of plants against *Pseudomonas tumefaciens* Smith and Town.]—*Proefschr. Univ. Utrecht*, 100 pp., 9 pl., 1935.

The results [which are fully discussed, the relevant data being tabulated] of inoculation experiments with strain 245 of *Pseudomonas* [*Bacterium*] *tumefaciens* from pear, maintained on malt agar since 1932 at the 'Willie Commelin Scholten' Phytopathological Laboratory, Baarn, on *Ricinus communis* var. *major*, *Bryophyllum crenatum*, *Impatiens balsamina*, and *Pelargonium zonale* (Miss Calvin variety) [*R.A.M.*, xiv, pp. 430, 499, 565] showed that this strain is exceptionally virulent, producing 100 per cent. infection as a result of needle inoculations. No apparent influence on the size of the tumours resulting from inoculation was exerted even by very considerable variations in the numbers of bacteria composing the inoculum.

It was observed in preliminary tests on *R. communis* var. *major* seedlings that the aptitude of the hypocotyl for tumour production decreases *pari passu* with its longitudinal growth after a given moment, probably at the inception of cell extension, of intense reaction to infection by the crown gall organism. No differences in susceptibility could be detected between flowering plants of *P. zonale* and those forcibly prevented from blooming [ibid., x, p. 779]. It was possible, however, to induce enhanced resistance to *Bact. tumefaciens* in *P. zonale* cuttings by immersing the cut ends for a period of 12 days in the diluted culture solution of living cultures of the organism grown on an unfavourable synthetic liquid medium; there was some indication that the solution also stimulated root formation by the host. It was further observed that the presence of a tumour on this host automatically inhibits, to a greater or lesser extent, the formation of a second tumour from a subsequent inoculation. Cut leaves of *B. crenatum*, treated with *Bact. tumefaciens* in a similar manner to *P. zonale*, reacted by some degree of stunting of the newly formed plants, but when transferred to soil they showed reduced susceptibility to crown gall, as also did a few shoots that developed in the leaf axils as a result of inoculation below the latter. Mutual inhibition of growth was caused by the tumours resulting from simultaneous inoculations in various internodes of a large number of *R. communis* var. *major* plants. *Bact. tumefaciens* was recovered from the tumours and the stems on which they were formed, but on reinoculation into *R. communis* var. *major* only a small proportion of large tumours was obtained, indicating that this highly virulent strain had undergone a very considerable weakening (reflected in the predominance of rough forms isolated) [ibid., xi, p. 226 *et passim*] by passage through the plants. The formation of rough variants was also a characteristic feature of cultures on the above-mentioned unfavourable synthetic medium, whereas not the slightest inequalities were observed in pure cultures of strain 245 of *Bact. tumefaciens* in congenial substrata, such as malt or bouillon agar, liquid malt, or liquid bouillon. This strain was found to be infected by a bacteriophage [ibid., xiii, p. 152], the lytic action of which was stronger after passage through *R. communis* var. *major*, *P. zonale*, and *I. balsamina* plants than when isolated direct from the bacterium.

Pflanzenschutzmittelverzeichnis des Deutschen Pflanzenschutzdienstes 1935–36. Mittel für Saatgutbeizung. [List of plant protectives of the German Plant Protection Service 1935–36. Preparations for seed-grain disinfection.]—*Biol. Reichsanst. Land- u. Forstw. Berl.-Dahl., Merkbl.* 7 (11th Ed.), 2 pp., 1935.

An alphabetical list is given of the seed-grain disinfectants officially recommended by the German Plant Protection Service for the control of wheat bunt [*Tilletia caries* and *T. foetens*], snow mould of rye [*Calonectria graminicola*], stripe disease of barley [*Helminthosporium grâmineum*], and loose smut of oats (*Ustilago avenae*) [*R.A.M.*, xiv, p. 380].

Bennett (F. T.). **Fusarium species on British cereals.**—*Ann. appl. Biol.*, xxii, 3, pp. 479–507, 2 pl., 9 figs., 1935.

Continuing his investigations of species of *Fusarium* on cereals in Great Britain [*R.A.M.*, xii, p. 754], nearly 30 of which have been isolated so far, the author gives details of the morphological, cultural, and pathogenic characteristics of *F. herbarum* [ibid., xiv, pp. 571, 709], *F. herbarum* f. 2 Wr, *F. equiseti* [ibid., xiii, p. 613], *F. equiseti* f. 1 Wr, *F. sambucinum* [ibid., xiii, p. 261], *F. sambucinum* f. 1 Wr, *F. trichothecioides* [ibid., viii, pp. 486, 520], *F. tricinctum*, and *F. merismoides* var. *majus* Wr [ibid., xi, p. 624], with drawings of each species. Experimental evidence was obtained that *F. herbarum* is capable of causing under favourable conditions a seedling blight, and under normal conditions a mild but persistent foot rot of wheat, resulting in reduced yield of straw and grain. In the field it is one of the commonest species on dead or unhealthy crop plants, often on the straw and glumes of cereals. A similar mild foot rot was caused in trials under normal conditions by *F. equiseti* in wheat, barley, and oats, as well as an obscure ear blight of wheat and barley; grains from inoculated ears showed a reduction of germination of from 25 to 75 per cent. and there were indications that the fungus is carried internally by the seed. The same applies to *F. equiseti* f. 1, except that in moist weather the symptoms caused by it on wheat and barley ears are more obvious; while not destructive as a seedling blight or foot rot organism it causes considerable loss by reduction of germination capacity and yield of grain. *F. equiseti* was found by the author associated with wheat and barley foot rot and its f. 1 on the underground parts of wheat, barley, and oats. In one year trials *F. sambucinum* f. 1 and *F. tricinctum* appeared to be of little, if any, importance as a cereal foot rot organism. The pathogenicity of the other forms was not investigated.

Verwoerd (L.). **The distribution and prevalence of physiologic forms of Puccinia graminis tritici in the Union of South Africa, 1930–1934.**—Reprinted from *Ann. Univ. Stellenbosch*, xiii, Sect. A, 3, 7 pp., 1935.

A comprehensive survey carried out in South Africa from 1930 to 1934 failed to reveal the presence of any new physiologic forms of *Puccinia graminis tritici* [*R.A.M.*, xi, p. 230], while of those already known, 13, 29, 98, and 100 were not found again. Form 99, previously recorded once on a grass host, *Dactylis glomerata*, was isolated on three

different occasions from wheat and once from *Lolium italicum*. Form 21 was collected in Cape Province once in 1930 and again in 1932. Form 34, which is widely distributed and was the prevailing form each year of the survey, occurred in 95·9 per cent. of the total collections determined; it was very seldom found mixed with others. Form 38, the second commonest form, has been isolated only on 33 occasions since first found in 1922; this figure represents 3·4 per cent. of the collections made during the survey.

MONTEMARTINI (L.). **Eccitabilità di organismi ammalati.** [The response of diseased organisms to stimulation.]—*Riv. Pat. veg.*, xxv, 7–8, pp. 293–303, 1935.

After briefly reviewing the results obtained in recent studies on the morphological, anatomical, and physiological effects of the infection of cereals by *Tilletia* and *Ustilago* spp. [*R.A.M.*, xi, pp. 502, 630, 631; xii, pp. 209, 558 *et passim*] the author describes his investigations on the action of latent infection by *T. tritici* [*T. caries*] and *U. tritici* on the phototropic and geotropic response of wheat.

Mentana wheat seed inoculated with *U. tritici* by Milan's method [ibid., xiii, p. 361], or with *T. caries* by Reed's method [ibid., iv, p. 343] or untreated, was sown in pots, and when the shoots had emerged rather more than 1 cm. above soil level the pots were exposed to unilateral light. The seedlings were then planted in the open and just before earing were pressed down horizontally to test the geotropic reaction. Finally, all the plants were examined for the presence of infection.

The results obtained showed that of 34 plants infected with *U. tritici*, 22 and 4 were among those which exhibited the most marked phototropism and geotropism, respectively; of 7 plants infected with *T. caries*, 5 were among the most phototropic and none amongst the most geotropic.

Latent infection, therefore, apparently increased the sensibility of the plants to light but reduced that to gravitation.

MITRA (M.). **Stinking smut (bunt) of Wheat with special reference to Tilletia indica Mitra.**—*Indian J. agric. Sci.*, v, 1, pp. 1–24, 7 pl., 2 graphs, 1935.

Wheat bunt (*Tilletia caries*, *T. foetens*, and *T. indica*) [*R.A.M.*, xiv, p. 80] is confined to the north-west of India, the first two species to the cooler regions, and the last-named to the plains. Among other characters *T. indica* is distinguished from the other two species by its black spore mass. A biometric analysis of the data obtained in a comparison of the spore sizes of two collections of *T. caries* from emmer and durum wheat supplied by Brentzel [from United States: ibid., xii, p. 618], a collection of *T. caries* from Gilgit, Kashmir, and two collections of *T. indica* from Karnal and Peshawar showed that the range of spore length and width in the emmer strain was 12 to 25 by 12 to 23 (average 18·3 by 17·1) μ, in the durum strain it was 15 to 28 by 15 to 22 (average 19·1 by 17·3) μ, and in the Gilgit strain 18 to 30 by 18 to 24 (average 22·5 by 20·7) μ. The range in the Karnal collection of *T. indica* was 25 to 55 by 22 to 42 (average 37·9 by 32·5) μ, and in the

Peshawar collection 27 to 46 by 27 to 44 (average 36·2 by 34·7) μ. These figures show that the spore sizes of *T. indica* are almost double those of *T. caries*, and on the basis of the differences of mean spore measurements, which are statistically significant, the author regards the collections as representing three physiologic forms of *T. caries* and two of *T. indica*. Inoculation studies have not yet been carried out.

Wheat grain naturally infected by *T. indica* yielded healthy plants at Pusa but infected ones at Karnal, and Pusa seed sown at Karnal gave a healthy crop, a difference in behaviour which is accounted for by variations in climatic conditions.

Experiments on control of the disease showed that seed treatment with uspulun universal, copper carbonate, ceresan, and formalin reduced infection but did not check the disease altogether.

LEEPER (G. W.). **Manganese deficiency of cereals: plot experiments and a new hypothesis.**—*Proc. roy. Soc. Vict.*, xlvii (N.S.), 2, pp. 225–261, 2 graphs, 1935.

Wheat plants growing on a heavily limed soil at Melbourne University have been found to suffer from lack of available manganese [*R.A.M.*, xiv, p. 122], a deficiency that may be corrected, as shown by experiments on the Federation and Free Gallipoli varieties, by acidification of the soil, preferably by means of sulphur, to at least P_H 6·5, or by heavy applications of manganous sulphate to the soil. The former treatment failed to improve the early growth or late tillering of the plants, but it increased the number of grain-bearing ears, the number of grains per ear, and the weight per grain. Powdered manganese sulphate gave the best results at the rate of 1 cwt. per acre, either sown with the seed or applied to the soil at germination, a residual effect being observed a year later [ibid., xiii, p. 676; xiv, p. 575]; the plots so treated, however, did not equal those acidified by sulphur. In laboratory tests manganese-deficient soils yielded under 15 parts of manganese per million of soil on leaching with normal ammonium acetate and 0·2 per cent. quinol [hydroquinone] solution at P_H 7, while healthy soils gave over 130 parts. It is suggested that the plant uses manganese dioxide as its source of manganese, either directly in the colloidal state or by reduction at the root-soil interface, and it is only the manganese dioxide dissolved by quinol at P_H 7 that can be so utilized, and not the more copious supply soluble under certain conditions with or without quinol at low P_H values (1 to 2). Where sulphuring is impracticable, e.g., on highly calcareous soils, an 'active', finely divided manganese dioxide should prove equally valuable with manganese sulphate in the control of manganese deficiency.

VANDERWALLE (R.). **Contribution à l'étude du mécanisme de l'action de la chaleur dans la désinfection anti-charbonneuse des semences de céréales.** [A contribution to the study of the mechanism of the action of heat in the anti-smut disinfection of cereal seed-grain.]—*Bull. Acad. Belg. Cl. Sci.*, Sér. 5, xxi, 7, pp. 759–765, 1935.

After carefully disinfecting a batch of barley seed-grain against loose smut (*Ustilago nuda*) by the standard hot water treatment (3½ hours pre-soaking followed by 10 minutes' immersion in water heated to

52° C.) [*R.A.M.*, xii, p. 280; xiv, pp. 431, 745], the writer removed the bracteal sheaths covering the embryo and, by means of Péterfi's micromanipulator, introduced through a glass micropipette a mycelial suspension of the fungus originating in a diploid monospore culture, the technique of the process being described. The plants developing from the inoculated seeds were smutted, indicating that *U. nuda*, normally a floral parasite, is capable under favourable circumstances of attacking the embryo. The author considers that the hot water acts directly on the latent mycelium in the embryo, while the pre-soaking process contributes to the efficacy of the method either by the augmentation of thermic conductibility or by stimulating the vitality of the mycelium and thereby increasing its sensitiveness to heat.

LEEMANN (A. C.). **Barley stripe disease.**—*Fmg S. Afr.*, x, 110, pp. 207–208, 3 figs., 1935.

Stripe disease of barley (*Helminthosporium gramineum*) does not ordinarily cause very heavy damage in South Africa [*R.A.M.*, x, p. 373], but in 1934 thousands of acres are reported to have been destroyed in the Alexandria district. The symptoms of the disease and the mode of infection are briefly described, with notes on predisposing conditions. Experiments on the Alexandria farms showed that crop rotation with maize is a sure means of promoting stripe infection, the incidence of which may be reduced by seed treatment with tillantin R, agrosan [see below, p. 13], or germisan. Legumes should be substituted for maize in the rotation, and the ploughing-under of diseased plants and grazing over the infested areas should be avoided.

BRIGGS (F. N.). **Inheritance of resistance to mildew, Erysiphe graminis hordei, in a cross between Hanna and Atlas Barley.**—*J. agric. Res.*, li, 3, pp. 245–250, 1935.

After stating that barley mildew (*Erysiphe graminis hordei*) is common in California, and is especially destructive to the late-sown crop, the author gives a brief, tabulated account of his studies in 1933 and 1934 at Davis, in that State, of the inheritance of resistance to form 3 of the mildew in a cross between Hanna (completely resistant) and Atlas (highly susceptible) barleys [*R.A.M.*, x, p. 176; xiv, pp. 92, 689]. The behaviour of the F_2 and F_3 progenies indicated that Hanna differs from Atlas in one factor for resistance, and that susceptibility is incompletely dominant. There was no evidence of linkage between mildew resistance and the factor pairs responsible for six-rowed as against non six-rowed ears, and for long-haired as against short-haired rachillae.

PETERSUN (B.). **Physiologic specialization in Puccinia coronata avenae.** —*Sci. Agric.*, xv, 12, pp. 806–810, 1935. [French summary.]

Crown rust of oats (*Puccinia coronata avenae*) [*P. lolii*], though of considerable importance in Eastern Canada does not usually cause appreciable damage in Manitoba and Saskatchewan, except where oats are grown in proximity to buckthorn (*Rhamnus cathartica*) hedges, although it was epidemic there in 1927, and is of minor importance in Alberta and British Columbia. The author gives a brief, tabulated account of his studies on physiological specialization of the rust in

Canada by means of the 11 standard differential hosts determined by him in agreement with H. C. Murphy [*R.A.M.*, xiv, p. 435]. The 544 collections of the rust in Eastern and Western Canada which were studied in the greenhouse from 1929 to 1934 were found to comprise 11 distinct physiologic forms, the reaction of which on the differential hosts is shown in an analytical key for their identification. Some of the forms (viz., 1, 2, 3, and 4) were found to be of common occurrence and to have recurred in each of the years reviewed, while others were rare (forms 5, 9, A, and B, with only 1, 3, 2, and 1 collections, respectively) or only appeared for one season (e.g., form 10 with 15 collections in 1929). Some of the forms, notably 1, 2, 3, 4, and 6, occurred both in Eastern and Western Canada, and while their relative prevalence varied considerably from year to year, forms 1 and 4 were in general much more common in Western than in Eastern Canada, the reverse being true of form 2; forms 3 and 6 were about equally prevalent in both areas.

Miles (L. E.). **New discoveries in relation to seed treatment which further emphasize the need for treating.**—*Agric. News Lett.*, iii, 8, pp. 7–9, 1935. [Mimeographed.]

Tests with twelve different lots of oats in Illinois, North Dakota, and Minnesota in 1933 showed that seed-grain treatment with ethyl mercury phosphate (new improved ceresan) [*R.A.M.*, xiv, p. 745 and next abstract] increased the yield by over 10 per cent. In the same year mercury-treated spring wheat out-yielded the untreated control lots by nearly 5 per cent. The stimulatory action of the disinfectant appears to be partially, or in some cases wholly, independent of the control of oats and wheat smuts [*Ustilago avenae* and *U. kolleri*, and *Tilletia foetens*, respectively], which were not an important factor in this series of experiments, the average amount of infection in 47 tests on oats being 7·4 per cent., whereas the increase of yield of the ceresan-treated seed was nearly 21 per cent., while in 9 and 15 wheat tests there were average increases in yield of 8·5 and 5 per cent., respectively, with only a trace of smut in the former tests and none in the latter.

Briefly discussing the reasons for these beneficial results, the writer thinks they are to be sought in the elimination from the treated material of parasitic seed- and soil-borne organisms rather than in a direct stimulus to plant growth, convincing evidence of which does not appear to be forthcoming. It has been shown in laboratory trials that the growth rate of seedlings from treated seed-grain exceeds by from 5 to 20 per cent. that of those from the controls, which are commonly overrun by moulds, the adverse effect of these on plant development being thus conclusively demonstrated.

Barbee (O. E.). **Markton and other varieties of Oats.**—*Bull. Wash. agric. Exp. Sta.* 314, 44 pp., 3 figs., 13 graphs, 1 map, 1935.

In trials to determine the reaction of the Markton variety of oats (stated to be almost exclusively grown in the eastern part of Washington) and a number of others to smut (*Ustilago levis*) [*U. kolleri*: *R.A.M.*, iv, p. 87; xiv, p. 436], the range of resistance (computed by Gaines's method) [ibid., v, p. 289] in the hulled group was from 29 per cent. for

Aurea to 100 for Markton, and in the hull-less from 4 per cent. for Chinese to 100 for hybrids between hull-less varieties (Chinese and Liberty) and Markton. Another very susceptible variety was Anthony (40 per cent. resistance), whereas complete immunity (100 per cent. resistance) was shown by Banner×Markton, and Red Rustproof, in addition to those already mentioned. The formaldehyde dip method of seed-grain treatment has given the best control of *U. kolleri* under local conditions, but the same preparation may also be used in the sprinkle, spray, or dust forms, or improved ceresan [see preceding abstract] may be applied at the rate of ½ oz. per bushel. Treatment of Markton is superfluous, and this variety may be sown at the rate of only 50 to 60 lb. per acre compared with 90 for the others enumerated.

Derick (R. A.) & Forsyth (J. L.). **A study of the causes of 'blast' in Oats.**—*Sci. Agric.*, xv, 12, pp. 814–824, 1935. [French summary.]

After giving a brief review of recent work on the condition in oats known as 'blast' or 'blindness' [*R.A.M.*, xi, p. 363], the results of which indicated that the disease is probably of a physiological nature, the author states that greenhouse and laboratory experiments started in 1932 at the Central Experimental Farm, Ottawa, have shown that its development is related to environmental conditions such as soil moisture, light, and nutrition. From a practical standpoint, the investigation appeared to show that the critical period for blast development is from six to eight weeks following sowing, the length of the period varying with the moisture supply during the early development stages of the oat seedlings. Excess water was effective in reducing the percentage of blast under field conditions from 23·4 to 19·4, while reduced water supply increased it to 36·5; corresponding percentages for the greenhouse experiments were 62·6, 49·2, and 64·9. Light had some influence in blast development, excess light increasing the percentage of plants affected from 62·6 to 70·6 while reduced light increased it to 66·1; combined with sub-normal water supply the figures were 64·9, 71·2, and 66·8 and with excess water 49·2, 67·3, and 55·4. Late sowing increased the development of blast, and late tillers were found to be more susceptible to the condition than earlier ones, presumably owing to lessened water supply and greater light intensity at the critical period. Statistical analysis did not show a significant correlation between percentage blast and total spikelet number.

Lepik (E.). **On occurrence of ergot (Claviceps) in Estonia.**—*Rep. Phytopath. Exp. Sta. Tartu* [*Dorpat*] 26, 13 pp., 1935.

This is a briefly annotated list of 52 species and varieties of Graminaceous plants which have been recorded up to date in literature or found by the author as hosts of the five species of *Claviceps* occurring in Esthonia. *C. purpurea* was collected on 42 of these hosts.

Smith (G. M.). **Incidence of bacterial wilt in experimental plantings of Sweet Corn at Lafayette, Indiana, in 1934.**—*Plant. Dis. Reptr*, xix, 12, pp. 204–208, 1 graph, 1935. [Mimeographed.]

In comparative experimental plantings of sweet corn [maize] (*a*) on sandy loam with a gravel subsoil and (*b*) on a silt loam with a fairly

heavy subsoil near Lafayette, Indiana, in May, 1934, the losses from bacterial wilt [*Aplanobacter stewarti*: *R.A.M.*, xiv, p. 752] on the former were practically negligible (from 0 in 69 strains, to 12·1 per cent., average 1·6 per cent.), except in the highly susceptible Early Crosby variety, whereas in the latter they ranged from 1·5 per cent. in Black Mexican to 63·3 per cent. in Early Crosby (average 15 per cent.). The average loss from the disease for the State as a whole would probably not exceed 5 per cent. Several cases were observed which failed to confirm the accepted view that the earlier types are more susceptible to wilt than the later ones, though in general the latter tend to be slightly more resistant. Early Crosby, however, with the highest average loss (50·5 per cent. plants killed), was one of the latest in the trials, whereas the very early Spanish Gold showed a low percentage of destruction (6).

Ranninger (R.) & Lerner (E.). **Saugkraft und Brandanfälligkeit bei Mais.** [Osmotic pressure and smut susceptibility in Maize.]—*Landeskultur*, ii, 10, pp. 187–188, 1935.

The maize season of 1935 in the drier parts of Austria was characterized by a reduced yield of fodder maize (only about one-third of the normal) and an exceptionally severe outbreak of smut [*Ustilago zeae*: *R.A.M.*, xiv, p. 750]. At the Weigelsdorf Agricultural School in Lower Austria, breeding for the production of varieties suitable for ensilage under dry climate conditions is in progress, the seed being tested for its osmotic pressure. It has been found that the plants from seed with high osmotic pressures have grown extremely well even in very dry seasons, but in the last season these were the plants that suffered most from smut. An extensive table is given showing that in over 4,000 plants examined the percentage infection in the high osmotic pressure series was 22·43, the corresponding figures for plants from seed with medium and low pressures being 9·24 and 8·87, respectively. The difference in the incidence of the disease was evident even when the seed showing the different grades of osmotic pressure came from the same ear. In a control plot of similar origin, but in which the osmotic pressure had not been tested, the percentage infection was 14·41. Most of the smut sori formed on the stem (33·4 per cent. on the lower part, 23·8 per cent. in the middle, and 26·3 per cent. on the upper part) and it is possible that the incidence of infection is correlated with the more luxuriant growth and larger stem and leaf development of the plants in the high osmotic series.

Neill (J. C.) & Brien (R. M.). **Experiments on the control of pink cob-rot of Maize.**—*N.Z. J. Agric.*, li, 2, pp. 65–69, 1 fig., 1935.

Severe losses are caused from time to time in the Poverty Bay and Bay of Plenty districts of New Zealand by a dry rot of maize cobs constantly associated with a fungus identified at the Imperial Mycological Institute as *Fusarium moniliforme* var. *subglutinans* [*Gibberella fujikuroi* var. *subglutinans*: *R.A.M.*, xiv, p. 15].

Experimental evidence showed that infected seed could be disinfected with little injury to germination by dipping for 10 minutes in water held at 138° to 142° F. Plants grown in sterile sand from in-

fected seed dusted with agrosan G or ceresan new (each at 2 oz. per bush.) [ibid., xiii, pp. 566, 570] or steeped for 1 or 2 hours in uspulun 0·25 per cent. remained practically free from root lesions, though corresponding plants from untreated seed were severely infected.

The amount of cob rot developing in the field, however, was unrelated to the amount of infection on the seed, heavily and lightly infected seed producing equal numbers of diseased cobs, while heavily infected seed in one locality produced fewer diseased cobs than disinfected seed in another. The field germination of lightly infected seed was much above that of heavily infected seed, and was much improved by dusting with agrosan G or ceresan.

The most practical means of controlling the cob rot consists in eliminating the sources of air-borne infection by burning all maize refuse and in crop rotation. Seed dusting with agrosan G or ceresan, costing about 5*d.* per bush., largely controlled seedling mortality from the disease.

Bitancourt (A. A.). **As doenças de virus dos Citrus.** [Virus diseases of Citrus.]—*Biologico*, São Paulo, i, 8, pp. 255–262, 1 pl., 1935. [English summary.]

The author states that comparative studies, based on the relevant literature and on his own observations, have shown the considerable analogies presented by the symptoms caused on citrus trees by psorosis, leprosis, ring blotch, and zonate chlorosis [cf. *R.A.M.*, xiv, p. 505], and would tend to confirm the view that these diseases are due to virus agencies, though this has not yet been conclusively demonstrated. While in general the lesions produced by all four diseases show great similarity on the various organs attacked (green shoots, woody twigs and stems, leaves, and fruits) [as indicated in the brief descriptions given], local differences do exist, but more of degree than of quality. Thus, while psorosis in the United States causes numerous and conspicuous lesions on the bark of woody branches, such lesions were seen for the first time in 1934 on grapefruit trees affected with zonate chlorosis and appear to be rare in Brazil; the identity of the latter disease with the former is indicated by the similar leaf lesions caused by the diseases in the two countries, though in the United States the lesions are much rarer than in Brazil. Fruit spots are relatively rare and of minor economic importance in ring blotch and psorosis, while they are abundant and cause appreciable losses in leprosis and zonate chlorosis. Certain points of resemblance between these diseases and the Navel orange spot described by Shamel, Pomeroy, and Caryl [*J. agric. Res.*, xxvii, pp. 521–526, 1924] and shown to be transmissible by budding, brown spot of Navel oranges [*R.A.M.*, xiv, p. 505], and some types of storage spot, also point to the possibility that these troubles, which hitherto were attributed to physiological causes, may eventually be proved to be due to virus agency.

Parisi (E.). **Per la conoscenza della gomma del Limone.** [A contribution to the knowledge of the gum of the Lemon.]—*Ann. Chim. appl., Roma*, xxv, 5, 230–236, 1935.

Among the products of hydrolysis of the gum exuded by lemon trees

at the Milan Agricultural College the following were identified: arabinose, galactose, small amounts of a methyl-pentose, and uronic acid (closely related to vitamin C). Neither glucose nor xylose, the principal degradation products of the cell-walls and wood, was detected. Hence it appears reasonable to infer that the gum is not a product of enzymatic action on the cell-walls of the diseased tissues but a concomitant either of the metabolism of the micro-organisms associated with the disturbance (chiefly *Phytophthora citrophthora*) [*R.A.M.*, xii, p. 565; xiv, p. 692] or of the hydrolysis of certain constituents of the plant which are almost or quite devoid of materials breaking down into glucose and xylose.

ARRILLAGA (J. G.). **The nature of inhibition between certain fungi parasitic on Citrus.**—*Phytopathology*, xxv, 8, pp. 763–775, 2 figs., 1935.

In mixed cultures at 25° to 28° C. of *Diaporthe citri* and either *Phytophthora parasitica* or *P. citrophthora* [*R.A.M.*, xiv, p. 754 and preceding abstract] isolated from citrus fruits in Porto Rico, not only was the growth of the *P.* spp. arrested but conspicuous morphological and physiological disturbances were produced in the mycelia, which branched profusely, assuming a witches' broom aspect, and showed a tendency to abnormal reproductive activity. *P. citrophthora* under these conditions formed oogonium-like bodies, 17 to 27 μ in diameter, staining orange-yellow with eosin, the development of which is attributed to the emission by *D. citri* of a diffusible, filterable substance, thermostable at 110° C. and therefore non-enzymatic, presumably associated with the metabolic products of the fungus, exerting a specific stimulus on the *Phytophthora* mycelium. The foregoing effects were reproduced in a series of inoculation experiments on oranges, lemons, and grapefruit.

MARCHIONATTO (J. B.). **Argentine Republic: new studies on the 'lepra explosiva' of the Orange.**—*Int. Bull. Pl. Prot.*, ix, 8 pp. 173–175, 1935.

Discussing the etiology of the destructive orange disease known in the Argentine as 'lepra explosiva', the author maintains that there is no evidence to implicate the reputed agents, *Amylirosa aurantiorum* [*R.A.M.*, xiv, p. 793] or *Cladosporium herbarum* var. *citricolum* [ibid., xi, p. 223] in its causation. Physiological factors are also excluded, since the condition has been artificially reproduced by inoculation with the expressed sap of affected plants, and it is thought that the disease may be due to a virus. Two common forms of 'lepra explosiva' have been observed, namely, the more frequent chronic disturbance, which does not kill the plant but weakens it excessively, and an acute phase resulting in death within two to five years. In addition to direct injury in the form of desiccation of the twigs and shoots, defoliation, and deterioration or shedding of the fruit, the disease paves the way for infection by *Colletotrichum gloeosporioides* [ibid., xiv, p. 754] and other pathogens. A measure of control may be achieved by the removal of diseased material, supplemented by spraying with Bordeaux-oil emulsion; studies on internal therapy are in progress.

VARGHESE (K. M.). **Diseases of the Coconut Palm.**—Bulletin issued by Dep. Agric. Fish. Travancore, 105 pp., 9 pl., 1934. [Received September, 1935.]

The observations in this semi-popular bulletin on plant diseases in general (Section I) and of the coco-nut in particular in Travancore (II) and other countries (III) are stated to be based mainly on the data accumulated by previous workers in the same field, supplemented by the writer's recent experience. The coco-nut diseases described from Travancore are bud rot (*Phytophthora palmivora*); leaf rot or bitten leaf [*R.A.M.*, iv, p. 734], associated in the West Indies with *Thielaviopsis* [*Ceratostomella*] *paradoxa* [ibid., x, p. 161; xi, p. 27; xiv, p. 145], but apparently due under local conditions to an as yet unidentified fungus; leaf blight (*Pestalozzia palmarum*) [ibid., xi, p. 780]; leaf stalk rot, the causal organism of which also remains undetermined, characterized by symptoms closely resembling those attributed in the West Indies to *P. parasitica* [Ashby, *West Indian Bull.*, xviii, p. 70, 1920]; fruit rot or mahali (*P. omnivora*) [*P. arecae*: ibid., iii, p. 570; iv, p. 165; x, p. 755 *et passim*]; stem bleeding (*C. paradoxa*).[ibid., xii, p. 76]; and wilt, believed from the erratic spread of infection and other features suggestive of parasitic activity to be of fungal or virus origin, the exact nature of which it is hoped to determine by the investigations now proceeding.

BLISS (D. E.). **Soil disinfection as a means of combating decline disease in Date Palms.**—*Twelfth Ann. Rep. Date Growers' Inst.*, pp. 13–16, 1935.

The infectious nature of the Californian date palm decline disease associated with a species of *Omphalia* [*R.A.M.*, xiii, p. 694] was shown by the increase in the number of diseased palms in one garden from 1 in 1921 to 31 in 1928, and 59 in 1934, and by a similar progress in four others. The diseased areas enlarge in all directions for an indefinite period at rates up to 30 ft. or more a year.

The fungus was found in the roots of a severely stunted, nine-year-old Deglet Noor palm up to, but never exceeding, a distance of 4 ft. from the trunk and down to 4 ft. below the soil surface, at which depth it was comparatively rare, though abundantly present in the upper two feet of soil round the base of the tree.

Of various soil treatments tried semesan applied to seedlings growing in inoculated soil in 5 gall. containers at the rate of 1 lb. per 20 ft. tree-square in three equal doses at intervals of one week gave 22·2 per cent. diseased plants, as compared with 35·3 per cent. in the inoculated but otherwise untreated controls; copper sulphate (50 lb.) was ineffective, and a heavy application of fertilizers containing available nitrogen, phosphorus, and potassium greatly increased infection.

In another experiment sterilized segments of healthy date palm roots inoculated with *Omphalia* sp. were buried in unsterilized soil in containers at depths ranging from 1 to 21 in. The soil in each receptable was then given a basic or a double dose of carbon bisulphide, formaldehyde, tetrachlorethane, or chloropicrin poured in through a hole, the basic doses being, respectively, 0·5 fluid oz., 2 galls. 1 per cent. formalin,

0·242 and 0·169 fluid oz. per sq. ft. of soil surface. One month later, *Omphalia* sp. was recovered from all the date roots in the untreated controls but from none in the soil given carbon bisulphide or chloropicrin. The basic doses of formaldehyde and tetrachlorethane had practically no lethal effect, though the double doses were partially effective.

Soil disinfection with carbon bisulphide against date decline has been practised in California for over a year, the diseased palms being removed and destroyed and the disinfectant poured into holes 18 in. deep, which are immediately closed; the soil is then watered if possible and covered er for about two or three weeks, when new shoots can be planted. It is too early as yet to judge the efficacy of this treatment.

Trichoderma lignorum [cf. ibid., xiv, p. 248] applied to infected potting soil, the P_H value of which was uncontrolled, failed to prevent infection of seedling palms.

Mallamaire (A.). **Sur quelques pourridiés en Côte d'Ivoire.** [On some root rots in the Ivory Coast.]—*Rev. Bot. appl.*, xv, 168, pp. 603–608, 1 pl., 1935.

The author states that further investigations have shown that the root rot caused by *Fomes lignosus* on coffee in the Ivory Coast is not restricted to the *Coffea liberica* and the indigenous Indenié variety [*R.A.M.*, xii, p. 91], but is also common on all the other varieties grown there. This crop is also attacked occasionally by *F. lamaensis* [*F. noxius*: ibid., xiv, p. 790], which, however, has not been so far observed to cause considerable damage. The use in coffee plantations of cover and shade plants such as *Albizzia lebbek*, *Leucaena glauca*, and *Tephrosia candida* is strongly deprecated, owing to their susceptibility to *F. lignosus*. This fungus was also recorded on *Hevea* rubber [ibid., xiv, p. 790], *Funtumia elastica*, *Styrax benzoin*, and *Oncoba echinata*. Cacao roots are severely rotted by *Armillariella* [*Armillaria*] *mellea* and *Lasiodiplodia* [*Botryodiplodia*] *theobromae* [ibid., xiii, p. 221; xiv, p. 87] as well as by *F. lignosus*. *Ganoderma applanatum* [ibid., xiv, p. 611] and *G. laccatum* were found causing root rots on the oil palm (*Elaeis* spp.) and *Citrus* trees, respectively, but do not appear to do much damage.

Mayne (W. W.). **Annual Report of the Coffee Scientific Officer, 1934–1935.**—*Bull. Mysore Coffee Exp. Sta.* 13, 28 pp., 1 graph, 1935.

Further work on coffee leaf disease [*Hemileia vastatrix*] in southern India [*R.A.M.*, xiv, p. 164] indicated that resistance to strain I (to which a considerable proportion of Kent plants are resistant) is transmitted by a simple Mendelian dominant factor. Resistance to strain II has been found only in association with resistance to strain I, in plants probably of hybrid origin, and the mode of its inheritance remains obscure. The progeny by self-fertilization from one plant showing complete resistance in the field were either resistant to both strains (like the parent), resistant to strain I only (like typical Kent), or susceptible to both (like ordinary Coorg), while seedlings from another selfed resistant plant were either resistant like the parent or susceptible like Coorg.

In spraying trials against the disease sulphemulsol 2 per cent. [ibid.,

xii, p. 522] proved to be ineffective and also caused some burning of young foliage; this, in conjunction with the results previously obtained with sulphur-containing sprays, appears to indicate that sulphur is not a satisfactory fungicide against leaf disease.

Die-back shoots invariably showed the presence of *Colletotrichum coffeanum* [ibid., xiii, p. 367], which was frequently the only fungus isolated; it was always found in shoots showing the very earliest external symptoms of the disease. That it was also common on the surface of completely healthy shoots in a season when other shoots were dying back suggests that it is not a primary, active parasite, but that certain predisposing conditions are necessary before the shoots can become diseased. Laboratory inoculation with *C. coffeanum* gave inconclusive results, symptoms of die-back occurring in both the inoculated shoots and the controls. Field observations showed that the first signs of blackening always appear at a node, the subsequent symptoms developing so rapidly that a shoot which, apart from having lost some younger leaves, appears quite healthy is sometimes dead within a week. The evidence obtained supports the view that the primary predisposing factor in die-back is premature leaf fall due to *H. vastatrix*, though complete leaf fall is neither necessary to, nor inevitably followed by, die-back [loc. cit.]. It seems clear that die-back is not a simple parasitic disease, but one in which many factors are involved.

De Fluiter (H. J.). **De topsterfte in de Koffie.** [Top die-back in Coffee.] —*Alg. LandbWeekbl. Ned.-Ind.*, xx, 2, pp. 34–36, 1935.

This is a summary of a lecture on top die-back of coffee [*Rhizoctonia* sp.: *R.A.M.*, xiv, p. 743] delivered at a general meeting of the Besoeki (Java) Coffee and Rubber Circle at Djember on 29th June, 1935. The disease, first observed in Sumatra in 1926, is stated to be now widespread in Java, the Besoeki district, however, having been spared until recently, when a number of estates in the Yang mountains and one in the Kalibaroe region were found to be affected. The maximum temperature for the growth of the causal organism is 25° to 26° C., a fact that is considered to explain its virtual absence from plantations situated below 400 m. above sea level. *Coffea excelsa* is the most susceptible variety and *C. arabica* the least.

Top die-back is controllable to some extent in the seed-bed by prophylactic treatment with Bordeaux mixture, but the use of this method on a large scale is scarcely likely to prove feasible. Drastic pruning offers the greatest hope of successful elimination of the fungus. Care should be taken to burn the debris, in which the organism may persist for six weeks in a viable condition. The branches should be cut back at least as far as the first healthy pair.

By means of stringent precautions, including the careful examination of suspected grafting material for the presence of the disease, the retention of such material in the beds for some months to check the possible development of infection, and regular spraying, it is hoped to prevent the further spread of top die-back by grafting. Subject to these expedients, the export of grafting material is continued from the Kaliwining Experiment Station, which is still free from the disease, but nursery stock for this purpose will not be supplied from the infected

to the non-infected areas. The possibility of the transmission of the fungus by coffee seed is regarded as negligible [ibid., xi, p. 636] and no restrictions will be placed on its movement, though a precautionary disinfection may be desirable.

The paper was followed by a discussion on the pros and cons of these arrangements.

RADA (G. G.). **Principales enfermedades del Algodonero en el Perú.** [The principal Cotton diseases in Peru.]—*Circ. Estac. exp. agríc., Lima*, 28, 19 pp., 6 col. pl., 4 figs., 1935.

Notes are given in popular terms on the distribution, etiology, symptoms, control, and other features of the cotton diseases in Peru caused by *Fusarium vasinfectum* [*R.A.M.*, xiii, p. 231], *Rhizoctonia* [*Corticium solani*: ibid., xiv, p. 629], *Erysiphe malachrae* [ibid., xi, p. 511], *Helminthosporium gossypii*, and *Alternaria tenuis* [ibid., xi, p. 225]. In connexion with the mode of dissemination of *F. vasinfectum* it is stated that a maximum of 3 per cent. of the spores is seed-borne. Very promising results were given in the control of *C. solani* by seed disinfection with granosan [= American ceresan: ibid., xiii, p. 488] and ceresan at the rates of 130 and 400 gm. per quintal [50 kg.], respectively. The Peruvian Tangüis cotton appears to be less susceptible to *E. malachrae* than a number of standard varieties from the United States.

MORWOOD (R. B.). **Angular leaf spot of Cotton.**—*Qd agric. J.*, xliv, 1, pp. 15–17, 1935.

A brief, popular account is given of the symptoms, cause, and control of angular leaf spot of cotton (*Pseudomonas* [*Bacterium*] *malvacearum*) [*R.A.M.*, xiv, p. 757]. The disease is believed to have been present in Queensland for several years, but until recently was not regarded there as of serious importance. In 1935, however, it was suspected of causing marked deterioration to the crop, though heavy loss of yield has not yet occurred.

SAMPSON (A. E.). **Various applications of fluorescence analysis.**—*Amer. Dyest. Rep.*, xxiv, 1, pp. 8–10, 19–20, 1935.

Among the applications of fluorescence analysis in the textile industry is the detection, by means of the Cellaphane apparatus [the construction and use of which are concisely explained], of the various moulds liable to damage cotton [*R.A.M.*, xiv, p. 762] by their conspicuous violet tones. The instrument consists of a folding box equipped with a filter, e.g., of Wood's glass [ibid., xii, p. 23] which excludes visible light while allowing the passage of ultra-violet rays. Details are given of the two general methods of procedure employed in the work of analysis—visual and photometric.

DURNOVO (Z. P.). **Sickness in Agriotes obscurus L. and A. sputator L. caused by the fungus Entomophthora sphaerosperma Fres.**—*Zashch. Rast. Vredit., 1935*, 1, pp. 151–152, 2 figs., 1935. [Russian. Abs. in *Rev. appl. Ent.*, A, xxiii, 10, pp. 573–574, 1935.]

Early in June, 1928, 80 per cent. of the adults of *Agriotes obscurus* and *A. sputator* occurring in large numbers on the unploughed strips of soil between fields near Moscow were found to be attacked by *Entomo-*

phthora sphaerosperma [*R.A.M.*, xiii, p. 232], while those on green baits in fallow land showed only 10 per cent. infection. By mid-June the epidemic ceased in the field, but it continued until the end of the month in the insectary, where 30 per cent. of the beetles were destroyed. The development of the fungus is thought to have been favoured by the prolonged spell of cold, damp weather in the spring.

IYENGAR (M. O. T.). **Two new fungi of the genus Coelomomyces parasitic in larvae of Anopheles.**—*Parasitology*, xxvii, 3, pp. 440–449, 5 figs., 1935.

English diagnoses are given of two closely allied new species of *Coelomomyces* [*R.A.M.*, i, p. 70] found parasitizing various species of *Anopheles* larvae in India, namely, *C. indiana* and *C. anophelesica*. The mycelium of both species is unicellular, very thin-walled, piriform in the early stages, later tubular, forming short branches but not anastomosing, 7 to 14 μ or more in *C. indiana*, 7 to 12 μ in *C. anophelesica*, and attached to the fat-body of the host, apparently by very minute hyphae. In *C. indiana* the mature sporangium, measuring 38 to 60 by 25 to 36 μ, is typically oval, with a thick, opaque, yellow, sculptured wall. In *C. anophelesica* the corresponding dimensions are 34 to 44 by 28 to 40 μ, the shape in this case being asymmetrically circular and the wall provided with many raised ribs running in concentric or eccentric circles.

The development of both parasites is completed during the larval phase of the mosquito. Infection generally starts in the thoracic region and spreads along the adipose tissue into the abdominal segments. In the later stages of the disease the insects have practically no fat tissue, the place of which is taken by a thin membrane filled with dark brown pigment granules. Death usually occurs before pupation can take place.

OTERO (P. M.) & KOPPISCH (E.). **La aspergilosis en el Pollito. Estudio preliminar.** [Aspergillosis in Chicks. Preliminary study.]—*Eighth Reun. Soc. argent. Pat. reg. N.*, pp. 143–159, 14 figs., 1934. [Abs. in *Vet. Bull., Weybridge*, v, 11, pp. 702–703, 1935.]

Isolations from the lungs of young chicks in the Argentine affected by an epidemic of pulmonary aspergillosis showed the presence of *Aspergillus fumigatus* [*R.A.M.*, xiii, p. 371] and *Rhizopus microsporus* [ibid., ii, p. 464; iii, p. 157; vii, p. 28], artificial inoculations demonstrating that the former was the chief causative agent. The source of the infection was the crushed sugar-cane refuse of which the nests were made. Histologically, the condition was characterized by a granulomatous inflammation with the presence of pseudo-tubercles and mycelium in the lungs.

SARTORY (A.), SARTORY (R.), MEYER (J.), & MEYER (M.). **Contribution à l'étude des mycoses : le diagnostic des mycoses par les méthodes de laboratoire.** [A contribution to the study of mycoses: the diagnosis of mycoses by laboratory methods.]—*Ann. Inst. Pasteur*, lv, 2, pp. 182–207, 1935.

A comprehensive account is given of the laboratory procedure adopted

by the writers for the study and identification of the Actinomycetes and other lower fungi involved in the causation of human and animal diseases. On the receipt of material suspected to be of mycotic origin a division is made into five parts for the following purposes: (1) examination for sporotrichosis, blastomycosis, or any other condition accompanied by a mycelium with hyphae of relatively large diameter; (2) examination for actinomycosis; (3) anaerobic investigations; (4) direct examination in smears or drops; and (5) animal inoculations. For each of the foregoing objects four tubes of nutrient medium are prepared as follows: (*a*) Sabouraud's maltose liquid (P_H 6·8), (*b*) the same solid, (*c*) potato juice with glycerine and agar (P_H 6·6), and (*d*) the same adjusted to P_H 7·2. It is pointed out that the liquid medium is useful only for actinomycetic studies, solid substrata being preferable in all other cases. The culture tubes are incubated at 37° C. for 48 hours. The application of this technique to each of the above-mentioned investigational aspects is very fully described, especially as regards the Actinomycetes, the conclusion being reached that the lower fungi in general, and this group in particular, are highly exacting in their cultural requirements and need very specialized individual methods of study.

Weisz (E.). **Über einige durch seltene Parasitenstämme verursachte Dermatomykosen.** [On some dermatomycoses caused by rare parasitic strains.]—*Derm. Z.*, lxxii, 1, pp. 1–10, 1935.

A concise summary is given of the literature on some rare forms of dermatomycosis [cf. *R.A.M.*, xiv, p. 694] due to *Aspergillus* spp., including *A. flavus*, *A. niger*, *A. terreus*, and *A. fumigatus*; *Penicillium glaucum*, *P. crustaceum*, and *P. minimum*; *Scopulariopsis* spp., including *S. brevicaulis* [ibid., xiv, p. 695] and *S. minimus*; *Cladosporium wernecki* [ibid., x, p. 666]; *Acremonium muthuoni*, *A. cordae*, *A. potroni* [ibid., xiii, p. 701], *Acremoniella berti*, and related species; *Scedosporium apiospermum* [ibid., xiii, pp. 512, 637]; *Hemispora stellata* [ibid., xiv, p. 169]; *Acladium castellanii* [ibid., xiv, p. 308]; *Trichosporum beigeli* [ibid., xii, p. 172]; and *Glenospora clapieri-catanei*.

Reed (A. C.) & Johnstone (H. G.). **A clinical study of intestinal fungi.**—*Amer. J. trop. Med.*, xv, 2, pp. 155–174, 1935.

No evidence could be found of any etiological association between a number of intestinal fungi including *Monilia* [*Candida*] *albicans*, *M. candida* [*C. vulgaris*], *M.* [*C.*] *krusei* [*R.A.M.*, xiv, p. 444], *Torula* sp., *Endomyces* sp., and an organism allied to *Oidium* [*Oospora*] *lactis*, isolated from fifty patients in California, and the disorders from which these persons were suffering [cf. ibid., xiii, p. 163].

Kessel (J. F.) & Holtzwart (F.). **Experimental studies with Torula from a knee infection in man.**—*Amer. J. trop. Med.*, xv, 4, pp. 467–478, 3 pl., 1935.

An account, dealing primarily with the clinical and experimental aspects of the case, is given of a granulomatous lesion of the knee in a 38-year-old Mexican in California caused by *Torula histolytica* [*Torulopsis neoformans*: *R.A.M.*, xiv, pp. 444, 758]. The results of

the inoculation tests on laboratory animals are stated to have raised certain questions with reference both to tissue selectivity of different strains of *Torula* and to spontaneous recovery from infection by the fungus.

Baeza (M.). **Notes upon non-chromogenous anascospored yeasts and the value of fermentation reactions in order to establish their botanical position.**—*J. trop. Med.* (*Hyg.*), xxxviii, 13, pp. 161–163, 1935.

Further tests in London and Madrid on the fermentation reactions [which are tabulated] of a number of non-chromogenous, anascosporous yeasts [*R.A.M.*, xiv, p. 192] confirmed the results obtained in previous experiments and again demonstrated the value of these responses as taxonomic criteria [ibid., xiii, pp. 636, 767].

Radaeli (F.). **Sopra un caso di onicomicosi da Cryptococcus interdigitalis Pollacci e Nannizzi.** [On a case of onychomycosis caused by *Cryptococcus interdigitalis* Pollacci & Nannizzi.]—*Boll. Sez. reg.* (*Suppl. G. ital. Derm. Sif.*), xiii, 2, pp. 171–172, 1935.

The fungus isolated from the nails of a young woman suffering from onychomycosis was identified by Prof. Pollacci as *Cryptococcus interdigitalis* Poll. & Nann. It was characterized in culture by white or whitish-yellow, pasty, smooth, glistening colonies composed chiefly of globose or oval elements, sometimes budding, with an average diameter of 4 to 5 μ, besides some large hyphae of a rudimentary mycelium. An unusual feature of the case was the brown, brownish-green, or green tinge imparted to portions of the affected nails by the fungus.

Ildrim (D. J.). **Madurapilz im Nordkaukasus (U.S.S.R.).** [The Madura fungus in the North Caucasus (U.S.S.R.).]—*Arch. Schiffs- u. Tropenhyg.*, xxxix, 8, pp. 348–349, 1935.

The fungus isolated at the Baku Tropical Institute from plantar abscesses on the foot of a female patient from the North Caucasus, and cultured on agar-glycerine (the only suitable medium among those tested) at 18° to 26° C., was characterized by hyphae of variable diameter, frequently septate, yellowish to blackish-brown with a green tinge, and mostly ending in clavate or more rarely fusiform swellings from which one to six spores were extruded. Intercalary chlamydospores were present and *Acladium*-like elements were occasionlly observed. This is believed to be the first record of 'Madura foot' [*R.A.M.*, xi, p. 242] in Soviet Russia.

Milian & Karachentzeff. **Epidémie de trichophytie propagée par un chat. Epidémie trichophytique à 'Microsporum felineum'.** [An epidemic of trichophytosis spread by a cat. A trichophytic epidemic due to *Microsporum felineum*.]—*Bull. Soc. franç. Derm. Syph.*, *1935*, 6, pp. 944–945; 7, p. 1357, 1935.

Microsporon felineum [*R.A.M.*, xiv, p. 581] was identified as the agent of a virulent ringworm originating in a cat and thence communicated in rapid succession to three persons.

Jacobs (W. A.) & Craig (L. C.). **On an alkaloid from ergot.**—*Science*, N.S., lxxxii, 2114, pp. 16–17, 1935.

The authors record the isolation of an alkaloid from ergot [*Claviceps purpurea*: see next abstracts] identical with the ergobasine of Stoll and Burckhardt (*C.R. Acad. Sci., Paris*, cc., p. 1680, 1935) and possibly the same as that described by Dudley and Moir (ergometrin) and Kharasch and Legault (ergotocin) [*R.A.M.*, xiv, p. 697], though the question of identity is left open for the present. Chemical evidence is submitted that the substance is hydroxyisopropylamide of lysergic acid.

Dale (H. H.). **The new ergot alkaloid.**—*Science*, N.S., lxxxii, 2118, pp. 99–101, 1935.

Reviewing the position with regard to the identity and nomenclature of the new ergot [*Claviceps purpurea*] alkaloid, the writer urges the prompt acceptance and standardization by all concerned of the name ergometrine (Dudley and Moir, 1932), with which it appears almost certain that ergotocin, ergobasine, and ergostetrine are identical [see preceding and next abstracts].

Rössler (R.) & Unna (K.). **Zur Pharmakologie des neuen Mutterkornalkaloides Sensibamin.** [On the pharmacology of the new ergot alkaloid, sensibamin.]—*Arch. exp. Path. Pharmak.*, clxxix, 1, pp. 115–126, 8 graphs, 1935.

The results of pharmacological tests at the University of Vienna showed that the new rye ergot [*Claviceps purpurea*] alkaloid, sensibamin (Chinoin A.-G. & Wolf, Ujpest, Hungary) [*R.A.M.*, xiv, p. 511 and preceding abstracts] possesses all the specific properties of the recognized alkaloids from the same source, and does not differ appreciably from them in toxicity and efficacy.

Mamell Calvino (Mme E.). **Malattie delle Rose prodotte da Coniothyrium.** [Rose diseases caused by *Coniothyrium*.]—*Costa azzur. agric.-flor.*, xv, 193, pp. 121–125, 2 figs., [? 1935. Abs. in *Riv. Pat. veg.*, xxv, 7–8, pp. 326–327, 1935.]

A short description is given of *Coniothyrium wernsdorffiae* [*R.A.M.*, xiii, p. 703], *C. rosarum*, and *C. fuckelii* [*Leptosphaeria coniothyrium*: ibid., xiv, p. 313] on rose trees near San Remo. The variety U. Brunner under glass at Col di Rodi showed the presence of *C. rosarum* on dried-up stumps left after pruning. The fungi are regarded as wound parasites, spread probably by insects. The paper concludes with brief directions for control by the disinfection of pruning wounds, spraying with Bordeaux mixture, improved ventilation in the glasshouses, and soil treatments.

Mehlisch (K.). **Der Rosenrost und seine Bekämpfung.** [Rose rust and its control.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 33, pp. 402–403, 1935.

A popular note is given on the symptoms and life-history of rose rust (*Phragmidium subcorticium*) [*P. mucronatum*: *R.A.M.*, xiv, p. 313],

and on its control by spraying with 1 per cent. Bordeaux mixture and appropriate cultural measures, including regular liming and the application to the soil of 'patent-kali' (potassium sulphate-magnesia). Susceptibility to the disease has been found to vary somewhat in different seasons in the Friesdorf [near Bonn] district of Germany. During the past year the *Rosa rubiginosa* hybrids Amy Robsart, Brenda, and Meg Merrilees, as well as *R. rugosa* K. Meyer were severely attacked, while in former years *R. canina*, *R. laxa*, and on one occasion the tea hybrid John Russell suffered extensive damage. On the whole, however, tea hybrids, ramblers, and the Polyantha types are well able to withstand infection by *P. mucronatum*, Kirsten Poulsen being the only one among 20 of the last-named group to show very mild symptoms.

Rosen (H. R.). **Rose blast induced by Phytomonas syringae.**—*J. agric. Res.*, li, 3, pp. 235–243, 6 figs., 1935.

A brief account is given of a diseased condition of the Magna Carta (hybrid perpetual) rose which was observed in the spring of 1933 at Fayetteville, Arkansas, characterized by the development on the receptacles, calyx lobes, flower stalks, and more rarely on the leaf petioles, of blackish-brown, necrotic lesions, varying in size and shape from oval or rounded spots not over 1 mm. in diameter to narrow streaks, 5 to 8 cm. in length. The individual spots and streaks were sunken, especially on the pedicels and receptacles, and often surrounded by a narrow red border. Most of the affected flower buds failed to open. Isolations from diseased tissues yielded an organism which was shown to be pathogenic to pear (Bartlett) and lilac, and to produce black pit lesions on lemons, typical of *Phytomonas* [*Pseudomonas*] *syringae* [*R.A.M.*, xiv, pp. 16, 319, 707], with which it is identified. Attempts to inoculate the pink Radiance rose with the organism gave negative results, and other rose varieties growing close to the diseased Magna Carta plants remained free from the trouble.

Mehlisch (K.). **Eine Blattfleckenkrankheit der Dahlie.** [A leaf disease of the Dahlia.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 32, pp. 390–391, 1935.

A considerable extension of the greyish-brown spotting and premature shedding of dahlia leaves due to *Entyloma dahliae* [*R.A.M.*, vi, p. 97; xiii, p. 655 *et passim*] is stated to have been recently observed in the Friesdorf [near Bonn] district of Germany. The chlorotic aspect of the foliage is sometimes accompanied by curling. The use of a 1 per cent. Bordeaux mixture is indicated. Similar symptoms are produced on *Calendula officinalis* by *E. calendulae* [ibid., xiv, p. 654], on poppy (*Papaver somniferum*) by *E. fuscum*, and on *Borago officinalis* by *E. serotinum* [ibid., iv, p. 191].

Riker (Regina S.) & Jones (L. R.). **Fusarium strains in relation to wilt of China Aster.**—*Phytopathology*, xxv, 8, pp. 733–747, 1 pl., 1 fig., 1935.

In further studies on the wilt of China aster (*Callistephus chinensis*) caused by ***Fusarium***, a preliminary note on which has already appeared

[*R.A.M.*, xii, p. 448], the authors found that ten forms of the section *Elegans*, capable of inducing wilt in other plants, failed to infect China aster. Tests of 27 strains from wilting asters showed some, but not all, to be pathogenic, and with the exception of *F. lateritium* var. *fructigenum* [ibid., xiv, p. 40] the pathogenic forms belonged to the *Elegans* section, though all the species belonging to this section could not infect asters. Varieties of the same species sometimes differed in their ability to induce wilt.

The writers conclude that the morphological and cultural characters of the species associated with aster wilt are not a reliable index of pathogenicity, and that substantially the same type of disturbance may follow infection by strains classified as belonging to different varieties, species, or even sections of *Fusarium*.

Balfe (Ilma G.). **An account of sclerote-forming fungi causing diseases in Matthiola, Primula, and Delphinium in Victoria.**—*Proc. roy. Soc. Vict.*, xlvii (N.S.), 2, pp. 369–386, 5 figs., 4 graphs, 1935.

In 1932 and 1933 a troublesome damping-off of *Matthiola incana* seedlings occurred at the Footscray Gardens, Victoria. From the diseased material *Rhizoctonia solani* (*Corticium vagum* var. *solani*) [*C. solani*] was repeatedly isolated and its pathogenicity established by inoculation experiments and retroculture. Comparative cultural studies were made on the strain of *C. solani* isolated from *M. incana* and three other cultures of the fungus, one from cereals in South Australia [*R.A.M.*, xii, p. 159], and two of Kühn's from the Centraalbureau voor Schimmelcultures, Baarn, Holland, originating, respectively, on potato and turnip [ibid., iv, p. 443]. On malt agar the optimum temperature for the growth of the *M. incana* and turnip strains was about 19° C., the corresponding figure for those from cereals and potato being between 26° and 28° [ibid., xii, p. 187]; at 30·5° to 32° the development of the turnip strain practically ceased.

Sclerotinia minor [ibid., xiii, 241] was isolated from the collar of diseased *Primula malacoides* growing in the Footscray Gardens. In culture on malt and oatmeal agars saltation was observed to occur, some of the sclerotia forming mycelium with sclerotia and others developing only microconidia. Transfers through successive generations from these microconidial cultures have as yet yielded no sclerotium-producing colonies. Two sclerotia of the fungus germinated after one hour's exposure to ether vapour during periods of very hot weather, but the apothecia did not mature.

Delphinium plants at Essendon, Victoria, were attacked by a fungus causing foliar yellowing and wilting, followed by desiccation and death due to the decay of the root and collar regions, which were encircled by a white mycelium with small, brown sclerotia. In pure culture on malt agar a fan-like growth of densely flocculent mycelium is produced and sclerotia of uniform size, subglobose, white at first, darkening to clove-brown, often exuding droplets of amber-coloured liquid. From a comparison of the fungus with *Sclerotium delphinii* [ibid., xiv, p. 147] and *C. centrifugum* [ibid., xiv, pp. 385, 701] (Wolf's strain of *S. rolfsii*) [ibid., xi, p. 748] the author considers, on the basis of vegetative characters alone, that it should be referred to *C. centrifugum*.

Crooks (Kathleen M.). **A powdery mildew of Boronia megastigma Nees.**—*Proc. roy. Soc. Vict.*, xlvii (N.S.), 2 pp. 365–366, 1 pl., 1935.

Boronia megastigma was attacked in Victoria in 1933 by an apparently new species of *Oidium* to which the name of *O. boroniae* is given with English and Latin diagnoses. The fungus is characterized by a dense, white mycelium with predominantly unbranched fertile hyphae, 6·5 to 9 μ in diameter, and ovoid conidia measuring 19 to 28 by 11 to 18 μ (average 28 by 13 μ). The mildew affected exclusively the petals of the flowers, the normally black outer surface of which was covered with a white mycelial felt and presented a dry, wrinkled aspect.

Fisher (Eileen E.). **'Sooty mould' of the tree-fern Dicksonia.**—*Proc. roy. Soc. Vict.*, xlvii (N.S.), 2, pp. 387–388, 1935.

The fronds of a *Dicksonia* in a fernery near Melbourne were found to be covered by a dense, black film, apparently formed exclusively by the fungus *Teichospora salicina*, one of the constituents of a sooty mould of *Bursaria spinosa* in Victoria [*R.A.M.*, xiii. p. 187]. The ascospores of the *Dicksonia* fungus measure 19·5 by 9·5 μ, these dimensions being slightly larger than those recorded for *T. salicina* on *B. spinosa*, but the pycnidial stages are identical in both cases (16·5 by 8·2 μ) apart from the occasional presence of a fringe round the ostiole in the *Dicksonia* strain.

Pape (H.). **Eine häufige Blattfleckenkrankheit an Phlox.** [A common leaf spot disease of *Phlox*.]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 35, pp. 426–427, 2 figs., 1935.

A popular note is given on the prevalent leaf spot of *Phlox paniculata*, *P. drummondii*, *P. virginica*, and *P. repens* [? *P. reptans*] in Germany caused by *Septoria phlogis* [*R.A.M.*, vi, p. 336]. The dark reddish-brown, white-centred, almost circular lesions are scattered over the leaf blades, especially on the lower, older foliage, which dies prematurely and shrivels. Diseased plants are stunted and generally flower scantily. The black, spherical pycnidia of the fungus, 100 to 200 μ in diameter, developing in the centre of the spots, contain curved, one- to five-celled, hyaline spores, 40 to 60 by 1 to 2 μ. In a North German nursery-garden in 1934 the U. Deutschland variety was very severely attacked and Mia Ruys practically free from infection, while a number of others showed intermediate reactions. Württembergia and other white varieties were heavily infected in a Central German establishment, where Hauptmann Köhl was immune. Control measures are briefly indicated.

Sommer (H.). **Ist die Welkekrankheit durch Saatgut übertragbar?** [Is the wilt disease transmissible by the seed?]—*Blumen- u. PflBau ver. Gartenwelt*, xxxix, 34, pp. 413–414, 1935.

The writer carried out an experiment at Darmstadt, the results of which showed conclusively that wilt disease (*Verticillium albo-atrum*) of *Antirrhinum* [*majus*: cf. *R.A.M.*, iv, p. 495; xii, p. 470] is not seed-borne. Infection developed, on the other hand, to the extent of 18 per cent. among plants from healthy seed in soil that had previously borne

neither *Antirrhinum* nor asters [*Callistephus chinensis*: cf. ibid., **xiv,** p. 447]. The Rubin variety proved to be considerably more susceptible than Schneeflocke (26 as compared with 12·5 per cent. infected).

White (R. P.). **Pestalotia spp. on Aucuba, Cibotium, and Leucothoë.**—*Mycologia*, xxvii, 4, pp. 342–346, 1 pl., 1935.

The author gives brief notes on, and Latin and English diagnoses of, three undescribed species of *Pestalotia* [*Pestalozzia*] from New Jersey, namely, *P. cibotii*, shown to cause the destruction of *Cibotium schiedei* fronds under greenhouse conditions [*R.A.M.*, xiv, p. 152], *P. aucubae*, a weak wound parasite on *Aucuba japonica* var. *variegata* and usually occurring on sun-scalded areas of the host, or following the large black leaf spots caused by *Colletotrichum pollaccii* [cf. ibid., vi, p. 175]; and *P. leucothoës*, a secondary parasite on leaves of *Leucothoë catesbaei* following other fungi or winter injury.

Michaelis (F.). **Erhöhte Wachstumsintensität und Pilzresistenz durch Plasmavererbung, sowie über die Bedeutung des Plasmas bei Kreuzungsschwierigkeiten.** [Enhanced intensity of growth and fungal resistance through cytoplasmic inheritance, together with a note on the significance of the cytoplasm in hybridization difficulties.]—*Züchter*, vii, 3, pp. 74–77, 2 figs., 1935.

In connexion with his studies at the Kaiser Wilhelm Genetic Institute, Müncheberg, Mark Brandenburg, on the cytoplasmic inheritance of vigorous growth and resistance to mildew (*Erysiphe* sp.) in the F_{11} progeny of back-crosses between *Epilobium hirsutum* and *E. luteum* [*R.A.M.*, xiv, p. 464], the writer points out that no definite conclusion can yet be reached as to the part played by the mother cell in the process. It seems probable, however, that the female cytoplasm merely serves to stimulate or depress the reactions of the male nuclear genes, and that it contains no actual bearers of hereditary characters comparable to the male genes. It is impossible at this stage of the investigations definitely to assert that the combination of *E. luteum* cytoplasm with *E. hirsutum* nuclear genes results in a blend of maternal and paternal characters, although the enhanced resistance to mildew, the branching habit of growth, and the broad leaves are typical of the female parent. The sole fact emerging from the experiments is that an hereditarily fixed cytoplasm influences the form assumed by the external characters.

A brief discussion is given on the possibilities of a general application of the principles involved in this particular instance, and also on the relation of the cytoplasm to compatibility between *Epilobium* parents in hybridization experiments.

Kuprewicz (V. F.). К биологии **Polythrincium trifolii Kunze (Dothidella trifolii Bayl.-Elliott et Stansf.).** [Note on the biology of *Polythrincium trifolii* Kunze (*Dothidella trifolii* Bayl.-Elliott & Stansf.).]—*Acta Inst. bot. Acad. Sci. URSS*, Ser. II (*Plantae Cryptogamae*) *1935*, 2, pp. 369–375, 1 fig., 1935. [German summary.]

The author states that cross-inoculation experiments in 1933, carried out both in pots and in field plots, showed the existence in the region

of Leningrad of two specialized forms of black blotch (*Dothidella trifolii*) [*R.A.M.*, xiv, p. 367] of clovers, inasmuch as ascospores collected on *Trifolium repens* were only able to infect their own host and to a somewhat lesser extent also *T. hybridum*, while ascospores from *T. medium* failed to infect both *T. repens* and *T. hybridum*, except in the greenhouse where a few plants of the last-named species proved susceptible, presumably owing to the exceptionally favourable environmental conditions. Attempts to infect *T. pratense* with ascospores of both forms gave negative results, and careful search in the region failed to reveal naturally infected plants of this species in the field. Inoculations with the spores of the conidial stage (*Polythrincium trifolii*) [loc. cit.] of the fungus invariably gave negative results.

Apart from the difference in pathogenicity, the two forms (for which the names ff. spp. *repentis* and *medii*, respectively, are suggested) also differ in the size and shape of their asci and ascospores, which measure 80 to 98 by 29 to 35 μ and 23 to 31 by 5 to 6 μ, respectively, in f. sp. *repentis*, as against 72 to 90 by 30 to 36 μ and 28 to 35 by 5 to 6·9 μ in f. sp. *medii*.

Rodigin (M. N.). Некоторые замечания о паразитном грибке **Plenodomus meliloti Mark.-Let.** [Some notes on the parasitic fungus *Plenodomus meliloti* Mark.-Let.]—*Acta Inst. bot. Acad. Sci. URSS*, Ser. II (*Plantae Cryptogamae*) *1935*, 2, pp. 353–354, 1935.

A serious collar rot of sweet clover (*Melilotus alba*) and a somewhat less injurious stem spot of lucerne were found in 1933 in the neighbourhood of Ulyansk, U.S.S.R., to be caused by a fungus which on isolation proved to agree closely with Mme Markova-Letova's description of *Plenodomus meliloti* on sweet clover from the Leningrad region (*Morbi Plantarum*, Leningrad, xvi, 3–4, p. 195, 1927), and is considered to be identical with it. A comparison of Markova-Letova's diagnosis with that of *P. meliloti* published by Dearness and Sanford from Canada in 1930 [*R.A.M.*, x, p. 110] leads the author to believe that both probably deal with the same fungus, in which case priority belongs to Markova-Letova's name.

Davis (W. H.). **Summary of investigations with Ustilago striaeformis parasitizing some common grasses.**—*Phytopathology*, xxv, 8, pp. 810–817, 1935.

Much of the information contained in this summary of the author's studies, covering a twelve-year period in Iowa, Wisconsin, Illinois, New York, Pennsylvania, and each of the New England States, on the leaf smut of grasses caused by *Ustilago striaeformis* has already been noticed [*R.A.M.*, ix, p. 390].

Additional evidence is here presented of physiologic specialization in the forms of the smut occurring on *Phleum pratense*, *Agrostis alba*, *Dactylis glomerata*, *Poa pratensis*, and *P. annua*, that on *D. glomerata* being raised to specific rank as *U. clintoniana* n.sp. on account of its larger, more regular, smoky brown, echinulate spores (12 by 10 μ), aggregated in globose to elongated masses between the leaf traces in the leaf blades, sheaths, and stems, and germinating with long germ-tubes; the species is only known to occur in these localities in New

York State and is stated to be 'biologically fixed' to its host. *U. salveii*, reported by Liro in his study on the Finnish Ustilagineae as confined to *D. glomerata* in Europe (*Ann. Acad. Sci. Fenn.*, A, xvii, p. 1, 1924) has considerably narrower spores (12 by 8 μ). For the American physiologic forms of *U. striaeformis* the following classification is proposed: f. *phlei* on *Phleum pratense*, f. *agrostidis* on *A. palustris*, f. *poae-pratensis* on *Poa pratensis*, and f. *poae-annuae* on *P. annua*, or, if Liro's system of classification be adopted, these forms would become *U. phlei-pratensis*, *U. agrostis-palustris*, *U. poae-pratensis*, *U. poae-annuae* spp. nov.

CHAMBERLAIN (E. E.). **Sore-shin of blue Lupins. Its identity with Pea mosaic.**—*N.Z. J. Agric.*, li, 2, pp. 86–92, 4 figs., 1935.

After referring to the close similarity between the sore shin disease of blue lupins (*Lupinus angustifolius*) in New Zealand and the lupin disease reported by Richter from Germany [*R.A.M.*, xiv, pp. 108, 109] the author describes experiments [the results of which are tabulated] in which six garden pea plants out of 24 inoculated with juice from affected blue lupins developed typical symptoms of pea mosaic, while all the 24 control plants remained healthy. Of 20 sweet pea plants inoculated with the juice from the infected garden peas two developed typical mosaic symptoms. Of nine lupins inoculated with the juice from one of the mosaic garden peas two developed typical sore shin symptoms.

Experimental evidence indicated that sore shin is not readily transmitted by *Thrips tabaci*. Aphids were not observed naturally infesting blue lupins, but sore shin was readily transmitted to this host from broad beans naturally infected with mosaic by *Aphis rumicis* and from mosaic-infected garden peas by *Myzus persicae*. Sore shin, pea mosaic, and broad bean mosaic are due, therefore, to the same virus which also affects sweet peas, red clover [*Trifolium pratense*], and various other clovers in New Zealand.

No evidence was obtained that the sore shin disease is seed-borne, and the virus is thought to overwinter in some other host, field observations indicating that red clover is implicated.

Stationary spraying plants.—*Fruit World, Melbourne*, p. 26, 1935.

After stating that over 70 stationary spraying plants, almost all of them of the return overhead type, are now in operation in Tasmania [*R.A.M.*, xiii, p. 529], the author points out a number of advantages that attaches to their use. The grower is independent of weather conditions in applying the different sprays, the difficulties encountered in transporting a heavy spray vat and engine over sodden ground are eliminated, there are no journeys to and from the water supply and no emptying and re-filling of vats, and steep banks and slopes are more easily negotiated [ibid., xiii, pp. 171, 218].

HOLZ (W.). **Eine Methode zur Feststellung des Befalls mit Fusicladium dendriticum vor dem Ausbruch der Schorfkrankheit bei Pirus malus.** [A method for the detection of attack by *Fusicladium dendriticum* before the outbreak of scab disease in *Pyrus malus*.]—*Zbl. Bakt.*, Abt. 2, xcii, 20–23, pp. 459–461, 2 figs., 1935.

The writer describes a method of detecting the presence of *Fusi-*

cladium dendriticum [*Venturia inaequalis*] in apple leaves during the incubation period of the fungus. The green leaves are boiled to transparency in 20 per cent. potash lye, whereby they shrink to a fifth of their original size and may be conveniently examined on slides after 5 to 10 minutes in 96 per cent. acetic acid, which should be rinsed off with running water. The slide should be slightly warmed before placing on the leaf a few drops of a 0·5 per cent. gentian violet solution, followed by a similar quantity of a very dilute cotton blue solution, all superfluous stains being immediately removed. Under the joint action of these two solutions the leaf veins are stained sky-blue and the mycelium reddish-purple.

Nath (P.). **Studies in the diseases of Apples in northern India. II. A short note on Apple scab due to Fusicladium dendriticum Fuckel.**— *J. Indian bot. Soc.*, xiv, 2, pp. 121–124, 1935.

Apple scab (*Venturia inaequalis*) is stated to be prevalent in Kashmir, and at Lahore in the conidial stage (*Fusicladium dendriticum*). The morphology of the fungus and its effects on the leaves and fruits are briefly described; affected leaves are said to fall readily. Conidia kept in a refrigerator at 3° C. for nearly three months failed to germinate; in the case of fresh material germination took place in 10 to 12 hours at 10° to 12° but did not occur at all at 30°. The rapid loss of germinative capacity by the conidia explains the inability of these organs to produce fresh infections in the following season [cf. *R.A.M.*, xiv, pp. 589, 590]. Only fresh spores, at low temperatures, are able to germinate.

Rudloff (C. F.) & Schmidt (M.). **Der Erreger des Apfelschorfes, Venturia inaequalis (Cooke) Aderh. Grundlagen und Möglichkeiten für seine Bekämpfung auf züchterischem Wege. II.** [The agent of Apple scab, *Venturia inaequalis* (Cooke) Aderh. Foundations and possibilities of its control by means of breeding. II.]— *Züchter*, vii, 3, pp. 65–74, 2 figs., 1935.

After summarizing the available information on the biology of the causal organism of apple scab (*Venturia inaequalis*) [see preceding and next abstracts], the reaction of different varieties of *Malus* [*Pyrus*] to the fungus, and the influence of environmental conditions on the parasitic relationships of the latter, the writers outline their plan of campaign for the development of resistant types of apple by means of breeding.

None of the cultivated varieties of apple appears to possess absolute resistance to scab irrespective of climatic conditions and local factors, but among the wild relatives of the fruit are a number of more or less resistant forms. The work of breeding must be commenced by a thorough investigation of the reaction to scab of the standard apple varieties in as many fruit-growing districts as possible with a view to their accurate grading from this standpoint, while at the same time the susceptibility of the wild forms should be tested by artificial inoculation. Among the latter will be some suitable for crossing with a superior commercial variety, and marked segregation of morphological characters being a feature of the F_1 progeny of such crosses, the production of a great variety of resistant types is to be anticipated.

The testing of the breeding material for scab resistance by mass inoculation is recommended, followed by tests of a more exacting nature and eventually by field trials. The morphological and physiological characteristics of the biologic forms of the fungus, the factors determining resistance, and other problems also require investigation in connexion with the work.

RUDLOFF (C. F.). **Venturia inaequalis (Cooke) Aderhold. III. Zur Formenmannigfaltigkeit des Pilzes.** [*Venturia inaequalis* (Cooke) Aderhold. III. On the pleomorphism of the fungi.]—*Gartenbauwiss.*, ix, 2, pp. 105–119, 14 figs., 1935.

Monoconidial cultures of *Venturia inaequalis* [*R.A.M.*, xiv, p. 241 and preceding and next abstracts] were isolated from a large number of apple varieties in different parts of Germany and at Wädenswil, Switzerland, and grown under uniform conditions on solid (agar) and liquid media. A striking degree of pleomorphism was shown by the various isolations, involving the type, topography, and rate of growth, the colour and structure of the mycelium, hyphal shape, and conidial production. Particularly striking from a morphological standpoint was the culture from Zuccalmaglio Pippin leaves in comparison with a Beauty of Boskoop strain, which may be taken as representing the 'normal' development of the fungus. Among the differences between these two strains, which were less apparent in pear juice and disappeared entirely on pear juice agar, were the following. On solid media Zuccalmaglio is characterized by profuse branching and forms no conidia, in contrast to Boskoop, which except on pear juice agar produces these organs in abundance. The Zuccalmaglio strain grows in a vertical direction except on pear juice agar, whereas Boskoop invariably develops horizontally. These results show that each of these strains reacts specifically to the different media. The Zuccalmaglio strain showed a pronounced tendency to spontaneous vegetative mutation. The examination of four mutants revealed the constancy of their typical cultural characters. One mutant produced a secondary variant, from which yet another arose. The aberrant types developed either by sectoring in an agar culture or in the process of subculturing. The occurrence of these and other mutations not enlarged upon here clearly demonstrates the unstable character of the Zuccalmaglio strain, a tendency that was subsequently found to be shared by that obtained from the Gratz' Liebling variety.

SCHMIDT (M.). **Venturia inaequalis (Cooke) Aderhold. IV. Weitere Beiträge zur Rassenfrage beim Erreger des Apfelschorfes.** [*Venturia inaequalis* (Cooke) Aderhold. IV. Further contributions to the strain problem in the agent of Apple scab.]—*Gartenbauwiss.*, ix, 5, pp. 364–389, 6 figs., 1 graph, 1935.

In further studies at the Kaiser Wilhelm Plant Breeding Institute, Müncheberg, Mark Brandenburg, on physiologic specialization in the apple scab fungus (*Venturia inaequalis*) [see preceding abstract], special attention was paid to the conidial characters of monospore cultures isolated from different hosts. Marked variations were observed not only in the abundance of conidial production but in the size and

shape of these organs developing in cultures from different hosts on the same medium (yeast extract plus 1 per cent. cane sugar) maintained at uniform temperatures. Thus, at the end of 33 days no conidia were produced by the cultures from the local varieties Winter Golden Pearmain and Muscat Reinette, whereas they were formed in profusion by the strains from Berne Rose, Adersleber Calvill, and Geheimrat Dr. Oldenburg, those from other varieties being intermediate in this respect. The shortest conidia in 24-day-old cultures, with a mean length of 20·31 μ, were those of the Geheimrat Dr. Oldenburg strain, while the longest (27·30 μ) were produced by the Antonowka. The mean breadth of the Antonowka conidia in 33-day-old cultures was $8{\cdot}67 \pm 0{\cdot}154\ \mu$ compared with $9{\cdot}08 \pm 0{\cdot}069$ and $10{\cdot}01 \pm 0{\cdot}107\ \mu$, respectively, for Ernst Bosch and Berne Rose.

Inoculation experiments with monospore isolations of *V. inaequalis* from various sources showed that all were capable of infecting not only the variety on which they originated, but also other varieties and species of *Malus* [*Pyrus*]. Re-isolated on an agar medium, all the cultures presented their original characters, irrespective of the intermediate host, indicating that the latter exercises no influence on the morphological features of the fungus in culture.

From 18 to 20 leaves of one tree each of Beauty of Boskoop, Cox's Orange Pippin, and *P. baccata*, 100 monospore cultures were isolated on nutrient agar and compared at identical ages. Beauty of Boskoop yielded 35, Cox's Orange 53, and *P. baccata* 23 distinct morphological types of the fungus, presumably representing hereditary strains and mixtures thereof, though definite proof of this assumption can only be obtained by the hybridization experiments which have already been initiated. It can definitely be stated, however, as a result of these investigations, that there is no direct correlation between morphological individuality in *V. inaequalis* and physiologic specialization on a particular host.

Van Zinderen Bakker (E. M.). **Investigations about the morphology and physiology of Physalospora cydoniae Arnaud.**—*Thesis*, Phytopathologisch Laboratorium 'Willie Commelin Scholten', Baarn, xv+114 pp., 8 pl., 10 graphs [1935]. [Dutch summary.]

In this elaborate study of the strain of *Physalospora cydoniae* (*P. obtusa*) [*R.A.M.*, xiv, p. 777] isolated by Miss Buisman from *Ulmus americana* in New England in 1929 [ibid., xi, p. 212], the author first summarizes in some detail the work which has been done on the nomenclature of the fungus, and considers that if type material of Peck's *Sphaeropsis malorum* agrees with Westendorp's *Haplosporella mali* (West.) Pet. & Syd. the latter name must be adopted for Peck's fungus and the name *Botryodiplodia malorum* (Berk.) Pet. & Syd. for *S. malorum* Berk. After discussing its geographical distribution, economic importance, and symptomatology the author states that in Holland the fungus has only been recorded twice and has not so far caused any serious damage.

In a series of experiments on malt salep agar the strongest growth occurred at 25° C. In modified Richards's solution the P_H optimum appeared to lie at 6, with possibly a second optimum at 4·4. A comparison

of the effect on growth of different sources of carbon showed that soluble starch gave the best growth, followed by dextrin, maltose, saccharose, glucose, fructose, and arabinose; even smaller growth took place with galactose or peptone, and the least with gum arabic, gelatine, and lactose; cellulose also was utilized by the fungus. With saccharose as a carbon source the optimum and maximum concentrations were, respectively, 27·3 and about 50 per cent. The best source of nitrogen for the fungus was peptone; asparagin was good and urea very bad. Nitrate nitrogen was very slightly preferred to ammonium nitrogen, but in strongly buffered solutions potassium nitrate and ammonium chloride, sulphate, and nitrate proved to be practically equal. In slightly buffered solutions with ammonium chloride as the nitrogen source strong acidification took place, the different P_H values of all the solutions finally reaching 3, while in similar solutions with potassium nitrate the final reading was P_H 4·8. The optimum and maximum concentrations of potassium nitrate were, respectively, between 1 and 3·4 and not over 6·8 per cent.

The optimum phosphate (potassium phosphate) concentration for growth was 0·27 per cent. but concentrations of 2·7 to 0·03 per cent. all gave good results. With lower concentrations the effect on growth was difficult to determine owing to the marked changes in P_H value. No growth occurred in concentrations of 13·7 per cent.

The optimum sulphur and magnesium concentration was almost reached in the solution containing 0·25 per cent. crystalline magnesium sulphate, though good growth occurred at 1 per cent. Growth was good without sulphur, but very poor without magnesium. The effect of the varying nutrient solutions was manifest in the modifications in mycelial growth, the greatest variation occurring in old, well-developed cultures.

Pigmentation and pycnidial formation were also considerably affected by nutrition. The latter decreased in the absence of sulphur and ceased altogether when magnesium was not present. Chlamydospores were usually formed in stale cultures in solutions containing a limited quantity of nutrients.

These investigations show that *P. obtusa* generally prefers high concentrations of nutrients and the author considers that this may be related to its habit of attacking the parenchymata of fruits, leaves, and twigs, where the concentration of cellular fluid is higher than in the vessels.

OSTERWALDER (A.). **Die Macrophoma-Fäulnis der Aepfel.** [The *Macrophoma* rot of Apples.]—*Landw. Jb. Schweiz*, xlix, 5, pp. 565–570, 1 fig., 1935. [French summary.]

French Pippin apples used in a storage experiment at the Wädenswil Fruit-Growing Institute during the winter of 1934–5 developed an unfamiliar type of decay, frequently commencing at the stalk and characterized in the early stages by a partial lilac-coloured discoloration of the flesh, later turning black and involving the skin. The fungus isolated from the diseased fruit formed a profusely anastomosing mycelium, which turned black in two to three weeks, but no spores were produced either on the apples or in culture. Inoculation experiments on six apple varieties gave positive results.

On the stalks of certain varieties, e.g., Beauty of Boskoop, pycnidia occurred with hyaline, cylindrical to elliptical or obtuse-conical spores, 26·6 to 28·7 by 11·5 to 12·3 μ and hyaline, cylindrical, pycnidial sporophores, 12 to 16 by 3·3 to 3·7 μ. On nutrient gelatine a single spore culture developed the typical mycelial stage of the apple fungus as described above, and inoculations with pure cultures from this source were successful on six varieties. The pycnospores germinate readily in water, forming a lengthy germ-tube in 24 hours. The morphological characters of the fungus suggest a relationship with *Macrophoma malorum* [*Botryodiplodia malorum*: see preceding abstract], and Delacroix's inclusion of this species in *Sphaeropsis malorum* Peck [*Physalospora obtusa*] is not acceptable to the writer on the ground that the ripe spores exuded from the pycnidium remain hyaline and smooth. *Phomopsis mali* [*R.A.M.*, xiii, p. 107] resembles the fungus under observation in its subepidermal development, but its spores measure only 7 to 10 by 2 to 4 μ. The usual mode of entry of *M. malorum* into the fruit is evidently by way of the stalk, but some of the apples examined had been attacked without any sign of stalk infection.

Verner (L.). **A physiological study of cracking in Stayman Winesap Apples.**—*J. agric. Res.*, li, 3, pp. 191–222, 3 figs., 1 graph, 1 diag., 1935.

The results of field observations in 1932–3 and of laboratory experiments in 1933–4 with Stayman Winesap apples in West Virginia did not support the hypothesis advanced by some earlier workers that cracking of the fruit [cf. *R.A.M.*, ix, p. 253], which in certain seasons and in certain localities may cause serious losses to the growers, is chiefly caused by sudden, considerable increases in soil moisture. While the trouble did not appear to stand in any relationship to fluctuations in air temperature, it was found that outbreaks of cracking were usually preceded by a period of greatly depressed transpiration of the trees, maintained for six hours or more, and though rainfall was naturally confined to such periods, cracking was correlated with slow evaporation rather than with rainfall. The presence of water on the fruit or foliage was apparently not necessary for the development of the disorder, which, however, occurred severely on apples still attached to the branch when immersed in water for several days. There was also evidence that cracking was more pronounced and extensive when the foliage was sparse than when it was dense. On individual apples it occurred chiefly at points showing some surface abnormality, such as russeting, sunscald, high coloration, and the like, the cortical tissues underlying which were shown to have a considerably higher osmotic pressure than the rest of the fruit.

Chaudhuri (H.) & Nath (P.). **Studies in the diseases of Apples in northern India. I. A new leaf-spot disease of Apples caused by Oothecium indicum n.sp.**—*J. Indian bot. Soc.*, xiv, 2, pp. 101–107, 1935.

From the purplish to rusty spots on apple leaves in crowded orchards in Kashmir the writer isolated on potato-glucose agar and other media a fungus characterized by anastomosing hyphae, 1·9 to 7·7 μ in diameter, globose, thick-walled, non-ostiolate pycnidia, 110 to 357·5 by

96·5 to 343·8 μ, containing numerous elliptical, lemon-shaped, or slightly curved, continuous, dark brown, smooth spores, 5·2 by 3·3 μ, borne either on extremely short conidiophores or directly on the inner wall of the pycnidium and escaping by the rupture of the wall. The absence of a stroma and ostiole definitely place the organism in the genus *Oothecium*, hitherto represented by only one species, *O. megalosporium* Speg., from which the apple fungus differs in pycnidial and spore dimensions and other characters. The latter is accordingly named *O. indicum* n.sp. [without a Latin diagnosis]. A table is given showing the growth characters of the fungus on the various substrata used. Development was more rapid in darkness than in light, the latter being requisite, however, for pycnidial formation. The growth of the organism was favoured by a humid atmosphere. It was killed by ten minutes' exposure to an atmosphere of 52° C.

Dippenaar (B. J.). **Studies in 'Kelsey spot' on Plums.**—*Fmg S. Afr.*, x, 113, pp. 333–336, 5 figs., 1935.

The Kelsey and other South African plum varieties suffer from three different types of spotting, namely, sun spot, Kelsey spot, and drought spot [*R.A.M.*, xi, p. 521]. The first-named invariably develops from the surface of the plum inwards within a day or two of the onset of extremely high temperatures and bright sunlight. The affected fruit presents the appearance and sometimes the taste of having been cooked. Kelsey spot may occur either on the exposed or sheltered side of the fruit in the form of superficial reddish lesions overlying deep-seated, brown, necrotic spots or lens-shaped cavities. This disorder develops some five days after a very hot spell (up to 90·5° F.) and three to four weeks before picking for export generally begins. Drought spot appears much earlier, and scarcely ever affects more than 2 to 3 per cent. of the fruit on a tree. A correlation was established between the direction of the sun's rays and the incidence of Kelsey spot, 43·2 per cent. of which developed on the northerly and only 8·3 per cent. on the southerly side of the plums. In an experiment in which the plums were stored for varying periods in an incubator the temperature of the fruit was found to rise very slowly. The critical temperature for the development of internal brown spots and cavities was shown to lie between 115° and 120°, and from the fact that such temperatures prevail in the orchard in late January it is concluded that sudden excessive heat is the primary cause of the sun and Kelsey spots, and probably also of drought spot. Heat spot' would therefore be the correct designation for all three types.

Dunegan (J. C.). **A Phytophthora disease of Peach seedlings.**—*Phytopathology*, xxv, 8, pp. 800–809, 2 figs., 1935.

Nursery peach trees at Bentonville, Arkansas, have been attacked of recent years by a destructive disease starting with the formation on the stem, well above the soil line, of a small, light brown lesion, which rapidly enlarges into a water-soaked canker 2 to 10 cm. long, sometimes extending downwards to the soil line. The tissues of the affected region are sunken, and gum is frequently exuded in profusion through epidermal fissures. As the canker progresses round the stem the terminal leaves develop a red discoloration and fail to unfold completely.

During the early stages of the disorder the root system remains healthy, and the root discoloration appearing after the death of the top is considered to be a purely secondary effect. Occasionally the shoot arising from a bud inserted in the autumn was observed to contract infection in the following spring, the symptoms in such cases being similar to the foregoing, except for a tendency of the shoots to collapse in the final stages.

A study of the local meteorological data in relation to the peach disease has shown that infection is favoured by heavy rainfall and cloudy weather during the early part of the growing season.

The fungus isolated from diseased material and grown in pure culture on maize meal agar was characterized by a long mycelium composed of profusely branching hyphae, 2 to 10 μ in diameter, on the slender branches of which ovate or variable, papillate sporangia, 30 to 45 by 24 to 36 μ in diameter, are sympodially produced; these germinate by a germ-tube and not, so far as is known, by zoospores. Tubular to spherical, mostly paragynous antheridia, subspherical, hyaline to pale yellow oogonia, 32 to 38 μ in diameter, and thick-walled, yellowish oospores, 25 to 30 μ in diameter, are formed in abundance on maize meal and Lima bean agar. The minimum, optimum, and maximum temperatures for the growth of the fungus were found to be 5°, 21° to 26°, and 32° C., respectively; the hydrogen-ion concentration permitting development ranged from P_H 4·0 to 9·0. In morphological and cultural characters the organism agrees closely with *Phytophthora cactorum* [*R.A.M.*, xiii, p. 783], to which it is accordingly referred. Its pathogenicity was demonstrated by a series of inoculation experiments resulting in the development of typical wilt symptoms in the test plants, the inoculations being made through wounds or by covering the soil with a mixture of sand and inoculated bran.

A histological study of the cankers showed the activity of the fungus to be confined to the cortex and cambium. Gum pockets are formed in the phloem region, while the outer parenchyma tissues disintegrate into a dark, discoloured mass resting on the cortical fibres.

The location of nurseries in well-drained sites appears to be the sole practicable control measure.

SMART (HELEN F.). **A new bacterial species isolated from Strawberries.**—*J. agric. Res.*, li, 4, pp. 363–364, 1935.

A description is given of the morphology and cultural characters of a bacterium, which in 1929 and 1930 was isolated in large numbers from many samples of fresh strawberries from four localities in the United States [cf. *R.A.M.*, xiv, p. 322]. The organism, which is named *Achromobacter delmarvae*, occurred chiefly on the outside of the fruit, and, so far as the author is aware, it has no bad effect upon the texture, flavour, appearance, or wholesomeness of the strawberries.

LEACH (R.). **Insect injury simulating fungal attack on plants. A stem canker and angular spot, a fruit scab and a fruit rot of Mangoes caused by Helopeltis bergrothi Reut. (Capsidae).**—*Ann. appl. Biol.*, xxii, 3, pp. 525–537, 2 pl., 3 diags., 1935.

The investigation briefly reported in this paper showed that the

Capsid insect *Helopeltis bergrothi* is the direct cause of four different diseases of the mango in Nyasaland [cf. *R.A.M.*, xiv, p. 561]. On the stem it causes cankers which appear as water-soaked, green, oblong-ovate lesions averaging 11 by 3 mm. in diameter, in the otherwise copper-coloured stem, and within 24 hours the lesions become slightly sunken and turn yellow-brown at the edges, but later they are either flush with the surface or slightly raised; occasionally they may be deeply cracked, causing open wounds in the stem. A bead of sap is often exuded from a fresh puncture and forms an ideal point of entry for bacteria and fungi (*Colletotrichum* spp. and *Phoma* spp.) to invade the cortex, which then becomes necrotic and blackened, 90 per cent. of the cankers being thus affected in damp and 30 per cent. in dry weather. Fungus fructifications may be present on the surface. On the leaves the insect causes an interveinal angular leaf spot, from 1 to 4 mm. in diameter, becoming a light yellow-brown with slightly darker edges in four to five days; occasionally the spots fall out, giving a shot-hole appearance to the leaf. On the fruits it gives rise either to a scab, when the stylets do not penetrate beyond the outer skin, or to a wet rot, when they reach into the middle skin; the rot spreads throughout the fruit in a manner extraordinarily like that of a rot caused by a fungus or a bacterium.

A black scab of avocado pear [loc. cit.] in Nyasaland, very similar in appearance to mango scab, has also been proved to be caused by the same insect.

Menzel (K. C.). **Untersuchungen der schädigenden Wirkungen kupferhaltiger Spritzmittel.** [Investigations on the injurious effects of copper-containing sprays.]—*Angew. Bot.*, xvii, 4, pp. 225–253, 7 figs., 1935.

An account is given of the writer's experimental observations in Schleswig-Holstein and Saxony on the nature of the injuries inflicted on apple and pear trees and certain test plants by spraying with Bayer's Bordeaux mixture (1 to 4 per cent.) [*R.A.M.*, xiv, p. 701], a home-made Bordeaux mixture, copper sulphate, and copper acetate.

The effects of spraying on the leaf structure was studied on *Pelargonium zonale*, *Impatiens sultani*, *Symphoricarpos racemosus*, and the susceptible Beauty of Boskoop apple variety. The first effect of the treatment on the leaves is a contraction of the cell-walls, the spongy parenchyma being thickened and the intercellular spaces largely eliminated, while here and there the cell contents begin to agglomerate and the palisade cells shrink. These changes are confined to the areas in actual contact with the fungicide and do not persist if the deposit is thoroughly washed off. Sudden wilting of the sprayed foliage may, however, result from an abrupt rise of temperature, which promotes the penetration of the copper, at this critical early stage. Even in the case of more severe scorching, involving the death of the cells, the damage may be restricted to a small area of tissue. The disintegrated cells are of a greenish-brown colour, or occasionally pure arsenic-green. The order of susceptibility to spraying injury in the leaf tissue is as follows: lower epidermis, upper epidermis, spongy parenchyma, and palisade parenchyma, the last-named being barely affected. Where

the injury is severe the entire tissue from the upper to the lower epidermis is destroyed and becomes separated from the healthy tissue by a wound layer. A greenish-brown or arsenic-green discoloration of the vascular bundles was also observed, frequently spreading into the interior of the leaf.

It was ascertained that pears and certain apple varieties, e.g., Horneburger Pfannkuchen [Pancake] and Schur, the leaves of which have a high osmotic value (osmotic pressure over 38, 26, and 29·7 atmospheres, respectively), are almost or quite insensitive to copper injury, whereas apples such as Gravenstein, Beauty of Boskoop, and Croncels Transparent with low osmotic values (5·3, 8·2, and 13·7, respectively), are liable to much more severe damage. Synthetic fertilizers, which tend to raise the osmotic values of the plants, simultaneously reduce their liability to copper injury. Heavier damage is to be anticipated on non-bearing than on bearing fruit-trees for the following reasons: (1) the copper-resistant palisade layers are reduced while the susceptible spongy parenchyma is profusely developed; (2) the epidermis is thinner; (3) osmotic values are lower; and (4) there is a high proportion of small, readily injured vessels. Sprayed leaves were found to wilt more slowly and transpire less freely than untreated ones. The injurious effects of copper sulphate, copper chloride, and copper acetate mixtures were found to be identical in nature, but it is highly probable that they differ in degree, though actual evidence on this point is not yet forthcoming.

Sprøjte og Pudderskade. [Spraying and dusting injury.]—*Medd. Forsøgsv. Plantek. Kbh.* 239, 4 pp., 1935.

An account is given of the damage inflicted on Danish orchard fruits by various standard fungicides [cf. *R.A.M.*, xiii, p. 358 *et passim* and preceding abstract], the reaction of 43 apple varieties to which is shown in tabular form. Bordeaux mixture (½: 1: 100 or 1: 1: 100) causes severe damage to Adams' Pearmain, Beauty of Boskoop, Cox's Orange and Cassel Pippins, and a number of others, while among those suffering from the use of lime-sulphur (2: 100) or sulphur dust are Frogmore, Hawthornden, Lane's Prince Albert, and Lord Grosvenor. Bouisol and sulsol [ibid., xiv, pp. 533, 560] cause approximately the same amount of damage as ½: 1: 100 Bordeaux and 2: 100 lime-sulphur, respectively. Pears are in general less susceptible than apples to spraying injury, but defoliation of Bonne Louise, Clapp's Favourite, Comice, Moltke, Williams' [Bon Chrétien], and others may follow lime-sulphur treatments, while Josephine de Malines and Nelis leaves are sensitive to Bordeaux. In 1934 several varieties, notably Tongres, bore severely shrivelled fruits as a result of post-blossom applications of ½: 1: 100 Bordeaux. Cherries seem to tolerate the regulation spray schedules very well, but the summer treatment of Victoria, greengage, and other plums may distort and discolour the foliage. Dormant treatments may generally be safely given in Danish orchards up to 1st March.

Robertson (W. C.). **Lime sulphur-wash and powders.**—*J. Dep. Agric. Vict.*, xxxiii, 8, pp. 386–391, 2 figs., 1935.

Recent analyses of different brands of commercial lime-sulphur on

the Melbourne market in comparison with the farm-made product and four samples procured from England indicated that the standard established by the Fungicides Act of 1920 is far too low [cf. *R.A.M.*, xiii, p. 315; xiv, p. 598]. Under the proposed legislation at present (August) before Parliament manufacturers of liquid lime-sulphur will be obliged to register their brands with the Department of Agriculture, including an analysis of the mixture. The analytical data further suggest the basing of standardization on the percentage of soluble sulphur in the mixture plus the percentage of soluble sulphur present as free polysulphide sulphur. Notes are also given on the preparation of self-boiled lime-sulphur and dry-mix sulphur-lime. Dry lime-sulphur—the residue left on evaporating the concentrated liquid to dryness—has the great advantage of saving freight but is little used in Victoria.

BARNES (B.). **Presidential address. Induced variation.**—*Trans. Brit. mycol. Soc.*, xx, 1, pp. 17–32, 1935.

In his presidential address to the British Mycological Society in 1935, the author presented selected data, culled from the relevant literature, and also resulting from his own mycological work [*R.A.M.*, x, pp. 331, 613], showing that definite variations can be and have been brought about artificially in living organisms (animals, insects, plants, bacteria, and fungi) by submitting them to the action of chemicals, high temperatures, X-rays, radium emanations, and ultra-violet light. The phenomena involved in such variations are far from simple, and it is probable that they cannot be brought under one explanation. While the nature of the change induced in the constitution of the variants still remains obscure, it seems highly probable that some nuclear change, and some mixing of nuclei of different qualities, must be concerned in a sectoring mycelium [ibid., xii, p. 782; xiv, p. 710], and in induced chimaeras in higher plants. The similar effects, however, which follow heat treatment and age, among other things, suggest that apart from nuclear changes, a general derangement of the physiological balance of the cell may also be responsible for variation.

List of cultures, 1935, Centraalbureau voor Schimmelcultures, Javalaan 4, Baarn, Holland.—106 pp., 1935.

In the introduction to this list of cultures at the Centraal-bureau voor Schimmelcultures, Baarn, Holland, the author states that at the end of 1934 the total collection amounted to 4,802, including 668 yeasts; in the same year 563 units were added, as against 468 in 1933.

The Bureau receives 63 per cent. of its income from various Dutch institutes, 31 per cent. from subscriptions and the sale of cultures, and the remainder from l'Union Internationale de Biologie, Section botanique. As the sale of cultures has declined owing to the straitened resources of many institutions and the complications of international money exchange, the financial position of the Bureau is, it is stated, becoming increasingly difficult, and it will not be possible to keep up the work unless additional financial support is forthcoming.

Mycologists and phytopathologists are earnestly requested to send to Baarn any species not mentioned in this list; cultures are obtainable in exchange.

Vaviloff (N. I.). Учение об иммунитете растений к инфекционным заболеваниям. [The theory of plant immunity from infectious diseases.]—101 pp., 2 col. pl., Госуд. Издат. Совхоз. и Колхоз. Литер. [State Publ. Off. Lit. Collect. & Co-op. Farming], Moscow, 1935.

This book is stated in a short preface to be the first attempt to supply the Russian plant breeder with a critical review of all the work done, both in Russia and abroad, on the various aspects of plant immunity from infectious diseases since the publication in 1919 of the author's treatise of plant immunity up to the beginning of 1934. It gives, among other matters, a comprehensive review of the study of inheritance of resistance in cereals and other important crops to virus, bacterial, and fungal diseases, and also to diseases caused by insects, besides touching on the theoretical aspects of plant immunity. The important bibliography appended at the end of the work covers 20 pages.

Budrina (Mme A. P.), Dobrozrakova (Mme T. L.), Karakulin (B. P.), Naoumoff (N. A.), Rudenko (D. K.), Stepanoff (K. M.), Tverskoy (D. L.), Tupinevitch (S. M.), & Khetagurova (Mme F. V.). Фитопатология [Phytopathology.]—340 pp., 132 figs., 1 graph, 5 maps, Госуд. Издат. колх.-совх. Литер. [State Publ. Off. Lit. Collect. & Co-op. Farming], Leningrad, 1935.

This is a somewhat elementary manual of phytopathology intended for students at the Russian agricultural schools and experimental stations, the separate chapters of which are compiled by one or other of the authors specializing in the subject treated, under the general editorship of Professor Naoumoff. The first part gives the general principles of diagnosis of physiological, parasitic, and virus diseases of plants, with morphological and taxonomic accounts of the causal organisms or agencies, and a brief discussion of plant immunity from disease. The second and third parts give a somewhat fuller account of the more important diseases of the chief crops cultivated in U.S.S.R. [exclusive of ornamental plants and forest trees], and the fourth deals with control methods, including the phytopathological examination of seeds and their disinfection.

Cottam (C.). **Further notes on past periods of Eelgrass scarcity.**—*Rhodora*, xxxvii, 440, pp. 269–271, 1935.

Further evidence has now been accumulated concerning past periods of eelgrass [*Zostera marina*] scarcity [*R.A.M.*, xiii, p. 647], e.g., along the Atlantic coast of North America and in France in 1893–4 and in 1878–9 and 1880–1 in Great Britain, none of which, however, appears to have been comparable to the present disastrous shortage. Recent observations along the Atlantic coast from southern North Carolina to Fundy Bay, between the eastern extremity of Maine and Nova Scotia, indicate that in most sections conditions are still very unsatisfactory—worse in fact locally than a year ago. Some improvement, however, is noticeable in areas of reduced salinity [ibid., xiv, p. 709] and in the more southerly latitudes.

HART (L. P.). **Development of mildew-resisting paints.**—*Paint Varn. Prod. Mgr*, xiii, 12, pp. 14–15, 2 figs., 1935.

A note is given on the precautions to be taken in the application of paints to a mildewed exterior surface [cf. *R.A.M.*, xiv, p. 520]. The addition of zinc oxide to the paint reduces the incidence of mildew, while mercuric chloride, phenol mercury acetate, and 'ammoniated mercury' [$HgNH_2Cl$] in proportions of 1: 500 to 900 are also effective. Red copper oxide may be used for the same purpose in red and brown paints and Paris green in green ones.

HYDE (R. R.). **An interpretation of the filterable viruses.**—*Amer. J. Hyg.*, xxi, 2, pp. 472–481, 1 diag., 1935.

The writer considers that twenty well-known virus diseases, including tobacco mosaic, should be definitely placed in a category apart from all others by reason of two important distinguishing features, viz., (1) the formation within certain cells of the host of characteristic inclusion bodies, and (2) the capacity of the causative agents to traverse filters retaining the microscopic forms of life [cf. *R.A.M.*, xiv, p. 722]. The term 'filterable viruses' should, it appears, be retained for the present on account of its generally established use, but filterability is not a fundamental property, for it depends on the nature of the filter used. Moreover, it is necessary to distinguish between filterable viruses and merely filter-passing bacteria.

Discussing the evidence for and against the 'living' nature of the filterable viruses [cf. ibid., xiii, p. 717; xiv, p. 260 *et passim*], the writer finds support for the theory in the fact that some of these agents are specifically adapted to a certain host, while in other cases, such as aster yellows [ibid., xiv, p. 312], an incubation period in an insect is requisite.

In conclusion the author draws attention to some striking contrasts between the filterable viruses and bacteria and expresses the view that a filterable virus, in the modern conception, is an agent of particulate nature, of ultramicroscopic dimensions, capable of passing filters retaining the vegetative forms of parasitic life, transmissible in series to sensitive hosts, producing typical inclusion bodies, not cultivable on lifeless media, and recognizable solely by the changes it causes in the bodies of man and animals and in plants.

OTERO (J. I.) & COOK (M. T.). **First supplement to partial bibliography of virus diseases of plants.**—*J. Agric. Univ. P.R.*, xix, 2, pp. 129–313, 1935.

This first supplement to the authors' partial bibliography of the literature of plant virus diseases [*R.A.M.*, xiv, p. 51] contains a large number of additional titles, many accompanied by a note indicating the scope of the work referred to. Useful indexes of authors and subjects to both the supplement and the original bibliography are appended, and there is a 13-page list of corrected errata to the latter.

SAMUEL (G.), BEST (R. J.), & BALD (J. G.). **Further studies in quantitative methods with two plant viruses.**—*Ann. appl. Biol.*, xxii, 3, pp. 508–524, 1 pl., 1 graph, 1935.

This is a tabulated account of the authors' study of some of the

factors which influence the estimation by the primary lesion method of the concentration of the viruses of tobacco mosaic 1 and of spotted wilt of tomato [*R.A.M.*, xiii, p. 662 *et passim*]. The work necessitating the comparison of as many as a dozen virus samples at a time, they adopted an arrangement of the experiments which allowed the comparisons to be made by the half-leaf method [ibid., xii, p. 527] in randomized blocks and Latin squares, which, for statistical convenience, presents a definite advantage over the leaf unit method recommended by Youden and Beale [ibid., xiv, p. 197]; in some cases, however, they also used the latter method, as giving the best results without the extra labour involved by the former. Some improvements were made in the technique of inoculation, the chief one being the increase of the ground glass spatula [ibid., xii, p. 527] from $1\frac{1}{4}$ to $1\frac{1}{2}$ in. in length, in order to fit comfortably across half of all except the largest leaves. It was shown that provided there is sufficient inoculum to cover the leaf when the spatula is rubbed over it, the amount of inoculum makes no difference to the number of lesions produced. It was further shown that the *Nicotiana glutinosa* plants used in the experiments gave the largest number of lesions when they were kept for 24 hours prior to inoculation in a basement at an approximately constant temperature.

The results of the comparative inoculations showed that the number of lesions produced by otherwise similar inocula varied with their P_H value and electrolyte content. The virus of spotted wilt of tomato produced on tobacco few lesions or none at all at P_H values below 5 and above about 9·2, while between 6 and 8·5 there appeared to be relatively small differences in the number of lesions produced by otherwise similar inocula, and at these values the inocula underwent very little change over a period of about three hours; occasionally, however, significant differences did occur within these limits. Tobacco mosaic virus also gave few lesions on tobacco with inocula at very low and very high P_H values. The inactivating action of cysteine hydrochloride [ibid., xiii, p. 662] is explained by these results since the P_H of the solution must have had a value about 2. The maximum number of lesions was produced by the tobacco mosaic virus in a potassium phosphate solution at concentrations ranging between 0·05 and 0·2 *M*. These results indicate that the viruses used in quantitative work should be buffered at a definite P_H value. It is pointed out, however, that when the effects due to varying P_H value and electrolyte content were excluded, the virus of tomato spotted wilt was still inactivated by certain oxidizing agents and preserved by certain reducing agents.

Cappelletti (C.). **Sulla fruttificazione basidiofora dell'Hypochnus catonii (Burgeff).** [On the basidiophoral fructification of *Hypochnus catonii* (Burgeff).]—*Nuovo G. bot. Ital.*, N.S., xlii, 1, pp. 265–266, 1935.

In a culture of *Cymbidium* seeds contaminated by *Cladosporium herbarum* the author observed basidial fructifications of *Hypochnus catonii* Burgeff [*R.A.M.*, viii, p. 589; xi, p. 317] in the mycelial weft mixed with the *C. herbarum*. The ovoid, fusiform basidia corresponded with those described by Catoni and were furnished with a variable number of narrow sterigmata bearing easily detachable, hyaline spores. The hyphae were generally moniliform and clamp-connexions were

observed. The presence of *C. herbarum*, besides causing the formation of the fructification of *H. catonii*, which did not occur in 20 other uncontaminated cultures, stimulated the development of the protocorms of the *Cymbidium* in the immediate vicinity.

Horowitz-Vlassova (Mme L. M.) & Livschitz (M. J.). **Zur Frage der Wirkung der Mikrobe auf Fette.** [On the question of microbial action on fats.]—*Zbl. Bakt.*, Abt. 2, xcii, 20–23, pp. 424–435, 1 fig., 1935.

Numerous fungi of the genera *Penicillium*, *Aspergillus*, *Sterigmatocystis*, &c., as well as bacteria are capable of splitting fats and oils [cf. *R.A.M.*, xiv, p. 604]. The lipolysis induced by fungal activity is characterized chiefly by the marked rise in the acid number of the fat phase, whereas glycerine is never detectable in the cultures owing to its ready fermentability. To a limited extent certain fungi, e.g., *S. nigra* [*A. niger*], *Citromyces pfefferianus*, and *Mucor racemosus* are able to disintegrate fats and oils by oxidation, a process characterized by the following features: formation of peroxides, oxy-acids, aldehydes, presence of lightly fixed oxygen, increase of the acid number of the water phase, reduction of the iodine number, and rise of the refractometric index. Fungal lipase and the oxidation-inducing ferment, to which the name 'lipoxidase' is applied, cannot be detected in the nutrient medium but may be found in the mycelium.

Leonian (L. H.). **The effect of auxins upon Phytophthora cactorum.**—*J. agric. Res.*, li, 3, pp. 277–286, 4 figs., 1935.

The results of the experiments described in this paper showed that while *Phytophthora cactorum* [see above, p. 35] makes no growth whatever when transferred to a solution consisting of the essential mineral salts and pure sugar (dextrose), the addition to this solution of a piece, about 1 in. in length, of the primary root cut from an aseptically germinating maize grain induces an excellent growth of the fungus and the formation of both sexual and asexual reproductive organs. This effect is attributed to a growth-stimulating substance in the maize root, which on circumstantial evidence is believed to be an auxin. Further experiments indicated that this substance moves in the root from the tip to the base, and that the amount of it diffused from an uncut root is negligible. The substance given off by the cut root does not induce growth of the fungus in the absence of the essential mineral salts and sugar; it withstood very rough treatment, including autoclaving, boiling of the maize root in 20 per cent. sulphuric acid, and the action of many toxic substances and protein precipitants, as well as the action of X-rays. Auxin solutions treated with 4 per cent. norit, an excellent adsorbing agent, no longer promote growth, since the growth-promoting substances are adsorbed, but such solutions still promote sexuality. In addition to the growth-promoting substances, therefore, there are sexuality-promoting factors which apparently possess different properties.

Muncie (J. H.). **Yellow dwarf disease of Potatoes.**—*Spec. Bull. Mich. agric. Exp. Sta.* 260, 18 pp., 7 figs., 1935.

Yellow dwarf of potatoes [see above, p. 3], first recognized in

Michigan in 1927, is stated to be now of considerable importance in the State, where the losses from this source frequently amount to 15 or 25 per cent. of the crop and in exceptional cases may involve a reduction of yield of 75 to 90 per cent. The disease causes severe damage to the Green Mountain, White and Russet Rurals, Russet Burbank, Irish Cobbler, and Katahdin varieties, and has also been observed on Bliss Triumph, Carman No. 3, Polaris, and Chippewa.

The symptoms of yellow dwarf are described [*R.A.M.*, i, p. 449]. The affected plants commonly range from 3 to 12 in. in height and have slightly thickened, brittle, yellowish foliage attached at an acute angle to the thickened stem. In severe cases the leaves are small and slightly curled, and the somewhat unusually dark green of the early stages is replaced in turn by a grey-green, dull yellow, and brown discoloration, similar changes taking place in the stem. On larger plants, the first signs of the disease are the yellowing and dying of the axillary buds near the tip of the stem or the pinching and marginal bronzing of the apical leaflets. Later the yellowing extends to the older leaves. In large plants with two or three stems arising from a single tuber, only one may show distinct yellow dwarf symptoms, but all the tubers from such a hill may produce diseased plants. A brown flecking of the pith at the growing tip of the stem [ibid., xii, p. 187], sometimes extending downwards and being most conspicuous at the nodes, is a marked feature of the disease. Severely diseased plants produce small, misshapen, often cracked and spotted tubers closely attached to the stem.

Under local conditions yellow dwarf occurs in the most virulent form in light, sandy soils during seasons of high temperature and low precipitation. At 60° to 70° F. the symptoms of yellow dwarf in greenhouse plants were largely masked, developing in an acute form only on the raising of the day and night temperatures to 75° to 90° and 60° to 75°, respectively [ibid., iv, p. 501].

Details are given of experiments in the transmission of the yellow dwarf virus by various methods, of which tuber grafting and insects, especially *Empoasca fabae* and *Macrosiphum solanifolii* [*M. gei*], proved the most effective, the results of soil, needle inoculation, and hypodermic injection tests being inconclusive. The clover leaf hopper, *Agallia sanguinolenta*, found by Black to be an active carrier of yellow dwarf [ibid., xiii, p. 721], occurs in abundance in Michigan in potato, clover, and lucerne fields, and the rapid spread of the disease may be in part attributable to the regular cultivation of lucerne over considerable areas in close proximity to potatoes.

Control measures should include the use of healthy seed, regular roguing at 10- to 14-day intervals throughout the growing season, and spraying at similar intervals with 8-12-100 Bordeaux mixture.

Köhler (E.). **Der Nachweis von Virusinfektionen am Kartoffelpflanzgut mit der Stecklingsprobe.** [The detection of virus infections in seed Potatoes by testing the sprouted eyes.]—*Züchter*, vii, 3, pp. 62–65, 4 figs., 1935.

Details are given of a modified form of the tuber-indexing method for the diagnosis of potato virus diseases [*R.A.M.*, xiv, p. 714] which is in use at the Biological Institute, Berlin. From the beginning of

January onwards the tubers are placed in a subdued light until the 'eyes' are sufficiently developed to be excised with an appropriate quantity of flesh and serve as cuttings. Extreme care must be taken during these operations not to transmit virus infections from one tuber to another, and in order to promote the suberization of the wound surface the cut tubers should be left overnight in a moist atmosphere. The tubers and corresponding eyes are consecutively numbered and the former set aside until required, while the latter are closely planted in shallow boxes. Early in February the boxes are placed in a well-lighted greenhouse and periodically fumigated. With practice it can readily be decided within eight weeks which tubers are fit for planting. In many cases the nature of the virus is obvious, e.g., in leaf roll which induces on the under side of the leaves the formation of anthocyanin spots. By means of inoculations on susceptible tobacco seedlings the various mechanically transmissible mosaic viruses may be determined and mixed infections by these recognized [ibid., xiv, p. 388]. At the same time light is thrown on the presence in the potato of latent viruses which may become significant when joined in the field by another infective principle and tend to cause tubers harbouring them to deteriorate rapidly under favourable ecological conditions [cf. ibid., xiv, p. 650]. For instance Magnum Bonum, Erstling [Duke of York], and Up-to-Date are consistently infected to a greater or lesser extent by ring mosaic, of which they are ordinarily so tolerant as to suffer little damage. Transferred to a 'degeneration-inducing' environment, however, such varieties are liable to virulent attack by mixed infections.

CLARIDGE (J. H.). **The identification and purchase of certified seed Potatoes.**—*N.Z. J. Agric.*, li, 2, pp. 107–108, 1935.

To assist purchasers of seed potatoes in New Zealand to identify Government-certified seed [*R.A.M.*, vii, pp. 387, 736] the author explains that the work falls into two stages, (1) provisional certification, merely showing that the growing crop after inspection for diseases and varietal purity has been found satisfactory, and (2) final certification after examination of the produce from a provisionally certified crop. Provisionally certified seed may be sold, but without guarantee, other than the word of the vendor, whereas every sack of finally certified seed bears an official tag. Arrangements have now been made for the final certification of quantities of 14 lb., 28 lb., or 56 lb. packed in standard crates.

SCHLUMBERGER [O.]. **Die Produktion krebsfester anerkannter Pflanzkartoffeln im Jahre 1933.** [The production of wart-immune certified seed Potatoes in the year 1933.]—*NachrBl. dtsch. PflSch-Dienst*, xv, 8, pp. 73–75, 1935.

A tabulated account is given of the production of seed potatoes immune from wart disease (*Synchytrium endobioticum*) in Germany in 1933 [cf. *R.A.M.*, vii, p. 50; viii, p. 523; xiv, p. 651], from which it appears that these varieties comprised 57·8 per cent. of the total material submitted for certification compared with 54·43 per cent. in 1932 and only 28·8 per cent. in 1927. The number of officially recognized wart-immune varieties is now 101, 54 relatively unimportant sorts

having been eliminated by the Reich Food Board. Among the well-known wart-immune varieties showing a falling-off in 1933 were Juli and Erdgold, while an increase was registered for Kaiserkrone, Preussen, Parnassia, Stärkereiche [Starchy] I, and a number of others. Among the susceptible varieties Industrie and Allerfrüheste Gelbe covered a smaller area in 1933 than in 1932, whereas the production of Erstling [Duke of York] and Odenwälder Blaue increased slightly.

SMALL (T.). **Potato blight (Phytophthora infestans) investigations in Jersey. Prevention of disease in export produce.**—*Ann. appl. Biol.*, xxii, 3, pp. 469–478, 1935.

The experiments briefly reported in this paper showed that the losses in potatoes exported from Jersey to England are chiefly due to contamination of the tubers at digging time (which is early, while the haulm is still green) with the spores of *Phytophthora infestans* and to packing infected but outwardly normal tubers from which the fungus can spread to healthy ones. The variety grown is International Kidney, which is very susceptible to the disease and, apart from export losses, diseased tubers rejected in the field account for a reduction of 5 to 20 per cent. in the yield. Loss from damage to the foliage is not usually important. Losses may be avoided in a large measure by regular and thorough spraying until the tubers are formed, when the crop should be dug at once, or the haulms cut or scorched. The amount of disease in transit was reduced by ventilation [*R.A.M.*, xiii, p. 592]. It was further shown that barrels which have already contained diseased potatoes present little or no damage. Scorching the green potato haulms in the field [ibid., xiv, p. 789] was very effectively done in Jersey with a dilution of 3 to 4 galls. commercial sulphuric acid in 40 galls. water.

CROSIER (W.) & REDDICK (D.). **Some ecologic relations of the Potato and its chief fungous parasite, Phytophthora infestans.**—*Amer. Potato J.*, xii, 8, pp. 205–219, 1935.

Summarizing the results of their own observations and experiments in New York and those obtained by other American and European workers, the writers find that temperature and humidity are the chief external factors in the rapid spread of late blight of potatoes (*Phytophthora infestans*) [*R.A.M.*, xiv, p. 715]. A relative humidity of 95 per cent. or above must be maintained for about eight hours to permit the production of a germinable sporangium, while rain or dew are necessary for the initiation of germination, swarming, and infection. Chilling is essential to stimulate sporangial germination. When external factors become operative at the critical moment for the optimum development of the parasite a very high degree of humidity must persist for 11 or 12 hours at least to permit infection.

In seasons when late blight is negligible or absent, tuber rot may occur in isolated hills by direct mycelial infection through the soil. Thus the fungus is perpetuated and the disease may again become widespread in the following year. Owing to the sensitiveness of the sporangia of *P. infestans* to desiccation the spread of late blight from a given centre is so slow as to preclude the migration of the fungus on

a scale that would explain the development of simultaneous outbreaks of the disease in widely separated areas.

SCHAAL (L. A.). **Rhizoctonosis of Potatoes grown under irrigation.**—*Phytopathology*, xxv, 8, pp. 748–762, 2 figs., 1935.

Rhizoctonosis of potatoes (*Corticium vagum*) [*C. solani*] is stated to be responsible for heavy damage in the irrigated areas of the Greeley district of Colorado. The stem infection phase of the disease [*R.A.M.*, ix, p. 671] chiefly affects the early-crop varieties, Bliss Triumph, Irish Cobbler, and Early Ohio, grown in cool soil. In a series of experiments on Bliss Triumph covering the period from 1930 to 1932 the most severe infection occurred among the stands planted in early April. For instance, of 60 stems examined six weeks after planting on 8th April, 1932, 44 were attacked, whereas little injury was observed among the plantings made after 1st May. The average minimum and maximum soil temperatures for the period from 8th April to 22nd May were 41° and 63·5° F., respectively, with a mean of 52·6°. Excess moisture and low soil temperatures have been found to coincide with heavy sclerotial infection on the tubers, which was experimentally shown to be increased by copious irrigation in the latter part of the season. Tuber disinfection experiments with various substances showed that mercuric chloride (non-acidulated) 1 in 1,000 [cf. ibid., xiv, pp. 527, 607] gave the best results (7·1 per cent. of tubers infected against 47·0 per cent. in the untreated) and a combination of this treatment with careful regulation of irrigation is recommended against the disease.

ROHDE (G.). **Kali im Stoffwechsel der Pflanzen unter besonderer Berücksichtigung der Kalimangelerscheinungen an Kartoffeln.** [Potash in plant metabolism with special reference to potash deficiency manifestations in Potatoes.]—*Ernähr. Pfl.*, xxxi, 13–14, pp. 237–243, 1 fig., 1935. [English and Spanish summaries on p. 256.]

The writer summarizes the results of his own observations in Germany and those of others on the role of potash in plant metabolism and the effects of its withdrawal, especially on potatoes [*R.A.M.*, ix, p. 741]. The symptoms of potash deficiency include a dull, dark green coloration of the foliage, stunting of the leaves due to crowding of the pinnules, general drooping resultant on disorganization of the water economy, cessation of growth before maturity, downward curling, brown spotting, and shrivelling of the leaves, reduction of flowering, poor root development, low starch content, and inferior keeping quality. Potash starvation is further liable to promote infection by mosaic and other diseases, notably scab [*Actinomyces scabies*], *Rhizoctonia* [*Corticium*] *solani*, blackleg [*Bacillus phytophthorus*], streak, leaf roll, and late blight (*Phytophthora infestans*). Wart disease [*Synchytrium endobioticum*] also seems to be related, at any rate indirectly, to potash, the proportion of which in immune varieties was shown by Finnish researches to be uniformly somewhat higher than that of susceptible sorts (P. Tuorila in *Wiss. Veröff. Finn. MoorKultVer.*, 1912) [cf. also *R.A.M.*, xiii, p. 723].

The following are among the microscopic structural changes commonly found in potash-starved plants: narrow epidermal cells, ill-defined chlorophyll layers, weak collenchymatous tissue, distended spongy outer parenchymatous tissue, looseness of bast tissue, single layers of cambium, and medullary rays, and incompletely developed vascular bundles.

Physiologically, potash-deficient potatoes are characterized by an initial increase followed by a decline in respiration [cf. ibid., xiii, p. 533], a reduction in assimilatory capacity and protein formation, an excess of nitrogen, a retardation of nitrate reduction, reduced enzymatic activity, an abnormally high P_H value of the sap, and low potash content. Cell division is relatively inactive and cell structure imperfect.

Cralley (E. M.) & Tullis (E. C.). **A comparison of Leptosphaeria salvinii and Helminthosporium sigmoideum irregulare.**—*J. agric. Res.*, li, 4, pp. 341–348, 4 figs., 1935.

This is a full account of the authors' studies of a fungus which they found causing a stem rot on rice in Arkansas, Louisiana, and Texas, and which in the 46th Annual Report of the Arkansas Agricultural Experiment Station, pp. 52–53, 1934, they had briefly described as a new variety *irregulare* of *Helminthosporium sigmoideum*. The new variety differs from the type species chiefly in that its sclerotia are irregular in shape and distinctly smaller, measuring only 268 to 342 by 90 to 110 μ, and are usually embedded in the substratum in irregular masses on radiating strands of the hyphae, while those of *H. sigmoideum*, the conidial stage of *Leptosphaeria salvinii* [*R.A.M.*, xiv, p. 119], are spherical or nearly so, and are formed singly and as abundantly by the aerial as by the submerged hyphae. The conidia of *H. sigmoideum* var. *irregulare* are similar in shape and size to those of *H. sigmoideum*, but in pure culture they are not so regularly tri-septate and many of them tend to produce germ-tubes from the apex while still attached to the conidiophore, a phenomenon which was never observed with *H. sigmoideum*. No perithecial stage of *H. sigmoideum* var. *irregulare* has so far been seen, either in nature or in culture, and numerous attempts to induce the fungus to produce sclerotia typical of *L. salvinii* gave negative results.

It is stated that in a Japanese book on crop diseases, published in 1934, Nakata identified as *H. sigmoideum* a fungus from rice with irregular sclerotia, which, from cultures sent by him to the authors, proved to be identical with their *irregulare* variety, while the fungus with spherical sclerotia, which has been shown to be *L. salvinii*, is described by him as *H. sigmoideum* var. *microsphaeroides*; these two designations are reduced to the rank of synonyms. Cultures of *H. sigmoideum* var. *irregulare* were also received and studied by the authors from the Philippine Islands and found to be essentially the same as those from other sources. Sakurai's *Sclerotium* No. 3 is also perhaps identical with it.

The pathogenicity of *H. sigmoideum* var. *irregulare* to rice was conclusively proved by laboratory and greenhouse experiments, the percentage of plants which became infected being 100 and 34·9 respectively.

FUKUSHI (T.). **Multiplication of virus in its insect vector.**—*Proc. imp. Acad. Japan*, xi, 7, pp. 301–303, 1935.

After demonstrating the transmissibility of the virus of rice dwarf through the eggs of its insect vector, *Nephotettix apicalis* var. *cincticeps* [*R.A.M.*, xiv, p. 468], the writer describes experiments carried out to determine whether it was similarly passed on to the third generation. A leafhopper bred from a viruliferous female and paired with a non-infected male produced infections in 38 plants, and laid 35 eggs, 26 nymphs from which were transferred immediately on hatching to healthy plants. Of these third generation individuals, the 15 surviving for a sufficiently long period proved to be viruliferous. Six were transferred daily to new healthy plants and caused infection in 13, 55, 35, 11, 50, and 28, respectively. Since the amount of virus originally contained in the body of a nymph must be extremely minute, it seems necessary to postulate the multiplication of the infective principle within the insect to explain the widespread dissemination of the disease in the absence of renewed access to a source of infection.

ENDÔ (S.). **Effect of sunlight on the infection of the Rice plant by Hypochnus sasakii Shirai.**—*Bull. Miyazaki Coll. Agric. For.* 8, pp. 75–78, 1935. [Japanese summary.]

In experiments conducted to ascertain the effect of sunlight on the infection of rice by *Hypochnus* [*Corticium*] *sasakii* [*R.A.M.*, xiv, p. 795], fully grown pot plants were inoculated by inserting a sclerotium between the leaf sheath and the culm near the ligule, and exposed to sunlight in the inoculation chamber maintained at 32° C. for 0, 3, 6, and 12 hours, after which they were transferred to a dark chamber kept at the same temperature; 24 hours after inoculation the sclerotia were removed and the plants placed in a greenhouse at 28° to 32°. The results obtained in seven sets of experiments showed that the percentage infection decreased with increased exposure to sunlight, the plants developing 37, 13, 5, and 0 lesions, respectively [cf. ibid., xi, p. 800]. Other tests [the results of which are tabulated] demonstrated that sunlight tended to inhibit both the development of mycelia from the sclerotia and mycelial growth itself. The author concludes that the reduced infection following exposure to sunlight was directly due to the influence of the sunlight on the fungus.

ENDÔ (S.). **Studies on the antagonism of microorganisms. V. Pathogenicity of Hypochnus sasakii Shirai, Hypochnus centrifugus Tul. and Sclerotium oryzae-sativae as influenced by the antagonistic action of the filtrates of certain fungous antagonists.**—*Bull. Miyazaki Coll. Agric. For.* 8, pp. 61–73, 1935. [Japanese summary.]

In these studies filtrates of cultures of *Aspergillus niger*, *A. parasiticus*, and *A. tamarii* grown in Saito's onion decoction for 21 days at 28°, were added to clean sand in Erlenmeyer flasks (50 c.c. filtrate to 100 c.c. sand) and the flasks were inoculated with the rice pathogens *Hypochnus* [*Corticium sasakii*: see preceding and next abstracts], *H. centrifugus* [*C. centrifugum*: see above, p. 24], and *Sclerotium oryzae-sativae* Sawada [*R.A.M.*, xi, p. 801]. After one to three days 40 healthy seeds of

the host pass through a period of maximum susceptibility significantly longer than normal in certain susceptible varieties and in trees deficient in potash or, possibly, calcium.

The actual thickness of the cuticle has no effect on penetration, the fungus being able to pass through even the thickest layers of cuticle on the fruit and petioles of susceptible varieties. Some resistance to penetration was, however, observed in resistant varieties and in the older leaves; this indicates qualitative differences in leaf cuticles. In shoots of Lane's Prince Albert, Crimson King, and King Edward VII the fungus entered the youngest leaf inoculated; in the older leaves a germ-tube and appressorium could be seen, but no penetration had occurred. In the resistant variety Grenadier penetration occurred, but the mycelium appeared to be weak and stained lightly.

JØRSTAD (I.). **Beretning om plantesykdommer i land- og hagebruket. Sprøiteforsøk mot Epleskurv.** [Report on plant diseases in agriculture and horticulture. Spraying experiments against Apple scab.]—Reprinted from *Landbruksdirektørens Beretning*, Tillegg G, 32 pp., 4 diags., 2 graphs, 1931.

The results [which are fully discussed and tabulated] of ten years' spraying experiments against apple scab [*Venturia inaequalis*] in Norway [*R.A.M.*, iii, p. 282] indicated that the most critical times for fungicidal treatment are immediately before and after flowering. The dormant application of lime-sulphur did not give satisfactory results, but summer treatments with it were generally effective and increased the yield by 25 to 30 per cent. when used in conjunction with suitable insecticides. No cases of injury to the leaves or fruit by lime-sulphur were recorded during these trials. The systematic application of Bordeaux mixture gave much better control of scab than lime-sulphur, but caused heavy damage to the Gravenstein and Torstein varieties. In the one test in which it was used sulphur dust gave good results.

MARSH (R. W.). **Apple scab control in the Bristol province: field trials, 1930.**—*Journ. Pomol. and Hort. Science*, ix, 1, pp. 53–72, 4 figs., 1931.

Excellent control of apple scab [*Venturia inaequalis*] was obtained when the trees were sprayed at the 'green flower', 'pink', and 'petal fall' stages, though less effective control resulted when the first spray was applied before the green flower stage.

The exposure of vaselined slides demonstrated that the sole source of infection in the author's experiments during April and May, 1930, consisted in the pustules present on the wood. Over 500 conidia were counted at various times on portions of the different slides, but not a single ascospore was recorded. It is pointed out that the technique employed may have favoured the retention and visibility of the conidia rather than those of the ascospores, while the preceding winter was exceedingly favourable to the complete destruction of fallen leaves. In spite of these circumstances, however, the author considers that the view held in America as to the importance of over-wintered leaves as the source of inoculum [cf. *R.A.M.*, vi, p. 299; x, p. 776] ought not to

be accepted without further examination as necessarily applying equally to Great Britain. Additional evidence pointing to the importance of scabbed wood as a source of primary infection in the spring was frequently obtained in 1930 by noting the proximity of the leaves first scabbed to active scab pustules on the twigs.

At Bridgwater no conidia were caught on the slides until the period 30th April to 15th May; at this centre the buds were at the pink stage on 3rd May. At Yeovil, where the dates for the different stages of bud development were approximately the same as at Bridgwater, no conidia were caught before 12th April, but 53 conidia per sq. in. were recorded in the period 16th April to 5th May. At Hereford, where the trees were about ten days later, 9 conidia per sq. in. were caught between 25th April and 8th May. Thus at Yeovil and Hereford the deposition of conidia was well marked during the fortnight before the buds reached the pink stage, but in none of the centres was there any record of conidia being deposited on the slides until after the 'burst' stage. The recommendation to give the first spray application at or about the green flower stage thus appears to be justified. If spraying is effected before this stage is reached, very few, if any, conidia are falling on to the young leaves, and the amount of leaf surface exposed to the spray is very small. As the leaves expand still further only the tips remain protected by the spray, the rest of the leaf being left liable to infection until the second spray is applied.

Moore (M. H.). **The effect of meteorological conditions on Apple scab, with special reference to the control of the disease.**—*Ann. Rept. East Malling Res. Stat. 1928, 1929, and 1930, II Supplement*, pp. 157–176, 1931.

The author reviews and discusses the relevant literature describing investigations made elsewhere than at East Malling into the effects of meteorological conditions upon the development of the perithecia and the viability, germination, and dissemination of the spores of *Venturia inaequalis* [see preceding abstract]. The literature dealing with seasonal variations in host susceptibility and the conditions governing the outbreak of scab epidemics is also reviewed, and the paper concludes with a discussion of the practical value of a spraying advisory service based on weather forecasts.

There is a bibliography of 42 titles.

Moore (M. H.). **Investigations on Coniothecium. A progress report.**—*Ann. Rept. East Malling Res. Stat. 1928, 1929, and 1930, II Supplement*, pp. 150–156, 1 pl., 1931.

After noting the frequency with which the russeting and cracking of apples have been attributed to weather conditions [cf. *R.A.M.*, iv, p. 743; ix, p. 253; x, p. 250], the author states that in October, 1928, his attention was drawn to a crop of Allington Pippins recently picked at East Malling. Prominent star-shaped markings were present on the skin, caused by its being ruptured radially from the lenticels. All the fruits showed the presence of a fungus along the edges of the cracks, the organism

fungi responsible for diseases in storage varying with the locality, a study was made of the fungal flora of the atmosphere surrounding the trees. The results obtained [which are tabulated and discussed] are based on accurate counts of growths developing on ten plates (area of medium approximately 700 sq. cm.) exposed simultaneously for five minutes, usually on a stand about 10 ft. above the ground.

The total number of organisms, expressed as the number falling per minute on 100 sq. cm., varied in the six different localities tested between July, 1929, and February, 1930, from 1 (Isle of Skye, sea-level) to 176 (Exning, Cambridgeshire). Apples from Exning always show considerable wastage when stored, and many of the fungi caught there are capable of causing fruit rot. Apples from East Malling usually show little wastage, and both total numbers and numbers of pathogenic forms of fungi caught were relatively low in this locality. This difference in degree of wastage was shown to be independent of the natural resistance to infection of apples grown in the two localities.

The experiments with half-apples on the correlation between the rate of fungal invasion and the nitrogen content [loc. cit.] were continued, one hundred Cox's Orange Pippin apples being inoculated on one half with *Fusarium* [*fructigenum*] strain D. The results obtained again showed that the nitrogen values ran parallel with those for radial advance [ibid., ix, p. 42].

Studies (with L. N. Seth) indicated that the changes that take place with age in the resistance of stored apples to fungal invasion are not related to the nitrogen content, but are associated with changes in acidity, sugars, pectic substances, &c. The organisms were grown in synthetic nutrient media in which the concentration of certain important chemical constituents of apples were varied. Nine different fungal strains were tested, and it was found that in *Diaporthe perniciosa*, strain DHF, *Cytosporina ludibunda*, strains CA_4, CC_2, and MK^1, *Phomopsis vexans*, *Fusarium* strains D and A, at all concentrations of glucose the rate of fungal growth fell with increasing acid, while at all concentrations of acid the rate of growth fell with increasing glucose. Using *P. coneglanensis* and *C. ludibunda*, strain CE, it was found that at glucose concentrations of 1·8 to 6 per cent. the rate of fungal growth fell with increasing acid; at glucose concentrations of 9 to 17 per cent. growth fell with increasing acid until a critical concentration was reached, when the rate of growth rose with increasing acid to a second maximum and fell again until growth ceased. At concentrations of acid of 0·025 to 0·21 per cent. the rate of fungal growth fell with increasing glucose; at concentrations of acid of 0·43 to 1·7 per cent. it fell with increasing glucose until a critical concentration was reached, then rising to a second maximum and falling again as before. The acid concentration is known to fall considerably with increasing age of apples, while the sugar concentration falls to a less extent. Acidity is, therefore, regarded as the more important of these two factors in the change of resistance with age. The relation between rate of growth and concentration of acid shown by the two strains *P. coneglanensis* and *C. ludibunda*, strain CE, is of considerable interest in view of

the instances of increase of resistance with age of Cox's Orange Pippin apples previously recorded [ibid., ix, p. 42].

BALAKHONOFF (P. I.). Квопросу о сортировке урожая. О причинах гнили Яблок в лежке. [The problem of crop grading. The causes of storage rot of Apples.]—*Plant Protection*, Leningrad, viii, 1, pp. 35–37, 1931.

The author states that the recent campaign to revive the fruit exporting industry in the Caucasus has brought to light the highly unsatisfactory situation there as regards the grading of the fruit, as too much is left to the personal factor among the grading personnel. Some graders, who have no strict rules to guide them, pass fruit presenting slight superficial lesions, e.g., small scab spots, healed insect punctures, or light bruises, as fit for long transit, with the result that a very considerable portion of the fruit arrives unmarketable at the place of destination. Thus in 1928 a big shipment of lemons, showing a slight attack by *Oviularia citri* in Novorossisk, developed during transit a severe rot caused by *Penicillium glaucum*, with a final wastage of about 50 per cent. In 1929, a cursory examination of apples passed by the local grader for long distance transport showed the presence at the point of shipment of a conspicuous percentage of heart rot (caused by species of *Monilia*, *Sphaeropsis*, *Penicillium*, and *Trichothecium*). Very frequently apples which are apparently quite sound soon develop serious rots when kept for a few days in the laboratory. All these facts show the necessity of unifying the fruit grading service in the Caucasus, and of publishing definite rules for the guidance of the personnel.

In North Caucasus the chief causes of heart rot of apples are stated to be *T. roseum* [*R.A.M.*, x, p. 321] and *Fusarium* (?) *putrefaciens*. Experiments with *M.* [*Sclerotinia*] *fructigena* and *P. glaucum* showed that both fungi very easily attack apples, not only through healed insect wounds and corky spots on their surface, but also through the apparently uninjured cuticle from which the natural waxy coating is rubbed off.

GOURLEY (J. H.) & HOPKINS (E. F.). **Nitrate fertilization and keeping quality of Apple fruits. Chemical, physiological, and storage studies.**—*Ohio Agric. Exper. Stat. Bull.* 479, 66 pp., 5 figs., 9 graphs, 21 diags., 1931.

The results [which are fully discussed and tabulated] of chemical, physiological, and storage studies extending over a number of years in Ohio indicated the complete absence of any correlation between the use of Chilean sodium nitrate as a fertilizer for apple trees and the development of physiological breakdown in storage [*R.A.M.*, ix, p. 114].

HEALD (F. D.). **Control of soft scald.**—*Better Fruit*, xxv, 10, p. 12, 1931.

After pointing out that common scald [*R.A.M.*, vii, p. 520; ix, pp. 533, 789] attacks apples of all varieties in cold storage, whereas soft scald [ibid., x, pp. 39, 606] mainly affects the Jonathan and Rome varieties, and stating that the use of oiled wrappers, so

successful in controlling scald [ibid., vi, pp. 102, 301, 622], has been found unavailing to prevent soft scald, the author tabulates some results obtained in January, 1928, from the cleansing of apples with brogdex [ibid., x, p. 452] before placing them in cold storage. Thus, out of one lot of Jonathans 22·5 per cent. of the untreated apples developed soft scald, while none of the brogdexed apples did; in another lot of Jonathans the corresponding figures were 44·4 and 0·95 per cent. Similarly, whereas 6·6 per cent. of a lot of Rome apples, untreated, developed soft scald, none of the treated ones did. In the author's opinion, these figures suggest that the brogdex process is of great value in preventing soft scald in stored apples.

DAVENPORT (A. B.). **Scald of Apples in storage.**—*Better Fruit*, xxv, 10, p. 14, 1931.

The author has found that the following conditions contribute to scald of apples in cold storage [see preceding and next abstracts]: immaturity at picking, delay in placing in cold storage, and loose storage for long periods before packing. The Black Twig, Jonathan, and Rome varieties are the most susceptible, while Newtown, Winesap, and Delicious apples remain unaffected unless stored late in the spring. The three last named have also developed scald badly when packing was deferred until December or later.

A large lot of Bosc pears stored loose showed 80 per cent. scald in February, though other lots in the same room and also stored loose showed little or no injury on the same date. None of the pears in the same house that had been packed earlier in the season showed any scald, and from the evidence available the author concluded that later picking combined with earlier packing in oil wraps would have prevented this wastage.

HARLEY (C. P.) & FISHER (D. F.). **A study of the internal atmosphere of Apples in relation to soft scald.**—*Proc. Amer. Soc. Hort. Sci., 1930*, pp. 271–275, 1931.

Investigations have been proceeding at Wenatchee, Washington State, since 1917 on the factors associated with the development of soft scald in Jonathan and other apple varieties [see preceding abstracts]. In the experiments herein described, Jonathan apples were placed on the day of picking (*a*) in common air-cooled storage at temperatures ranging from about 60° F. in the early part of the season to below 40° in midwinter, and (*b*) in cold storage at 30° to 32°, while a third lot was stored at 70° for varying periods (up to 15 days) before transference to cold storage.

None of the fruit held in common air-cooled storage developed soft scald at any time during the investigations, and very little, if any, was observed among apples transferred to cold storage within 24 hours after picking; a longer delay at 70° resulted in the occurrence of the disease in varying degrees of intensity according to the length of postponement. The maximum severity of soft scald was apparently reached after six days at 70°. It was observed that fruit (Jonathan and Grimes Golden) allowed to remain on the tree for some time after the commercial picking

dates showed a tendency to develop soft scald even on immediate cold storage. Large apples were found to be more liable to soft scald than small ones.

Analyses of the intercellular gases were conducted in connexion with the 1928 experiments, the gases being withdrawn from the tissues at regular intervals (at first daily and subsequently weekly) by a modification of Magness's apparatus (*Bot. Gaz.*, lxx, p. 308, 1920), and analysed in a Bonnier-Mangin apparatus. The intercellular gases of Jonathan apples at the time of picking on 13th September contained an average of 3·8 per cent. carbon dioxide and 16·5 per cent. oxygen. When the fruit was placed immediately at 30° to 32°, the carbon dioxide fell to 3 per cent. on the fourth day, remained fairly constant for two months, and then began slowly to increase, reaching 3·6 per cent. after three months in cold storage. The oxygen increased in cold storage from 16·5 to 19·4 per cent. in four days and remained practically constant throughout the three months of storage. In fruit initially stored at 70° there was an increase of carbon dioxide and a decrease of oxygen, reaching a maximum (9 per cent.) for the former and minimum (15·2 per cent.) for the latter in six days. On transference to a temperature of 30° to 32°, the carbon dioxide percentage fell rapidly and the oxygen content increased, reaching the values of the fruits stored immediately at 32° in about four days. Thereafter practically no difference could be detected in the carbon dioxide and oxygen values between fruit stored immediately and that delayed at 70°.

These results might be thought to indicate that high carbon dioxide concentrations within the tissues at the time of bringing into low temperatures establish the conditions ultimately leading to soft scald. However, in other trials in which apples coated with mixtures of paraffin and mineral oil were subjected to the above treatments, no soft scald developed notwithstanding the high percentages of carbon dioxide and low oxygen content (15·8 per cent. carbon dioxide and 6·1 per cent. oxygen in the delayed fruit, the corresponding figures for the same lots in cold storage being 11·7 and 13·6 per cent. respectively). The presence of high concentrations of carbon dioxide in the tissues cannot, therefore, be regarded as the primary agent in the initiation of soft scald.

Three possibilities of practical control of soft scald in Jonathans may be suggested, namely, (1) common storage at temperatures above 32°; (2) rapid arrest of respiration by the use of carbon dioxide; and (3) immediate storage at 30° to 32°, of which the last is probably the best.

Fisher (D. F.), Harley (C. P.), & Brooks (C.). **The influence of temperature on the development of watercore.**—*Proc. Amer. Soc. Hort. Sci., 1930*, pp. 276–280, 1931.

During July and August, 1926, experiments were conducted at Wenatchee, Washington, to determine the effect of temperature on the incidence of water-core in Winter Banana (susceptible), Gano (non-susceptible), and other apple varieties [*R.A.M.*, x, p. 116]. One lot of each variety was covered with black cambric, a second with transparent cellophane, a third with white cambric, and

a fourth left uncovered. The side of the Winter Banana apples exposed to the sun and covered with black cambric (average temperature of fruit 117° F.) showed 88 per cent water-core, the corresponding figure for Gano being 63 per cent. The percentages of water-core in the Winter Banana lots covered with cellophane and white cambric, respectively (temperatures 111° and 102°), were 61 and 8, while the uncovered lot (98°) also showed 8 per cent. Severe water-core further occurred in a group of densely shaded green Winter Banana apples exposed to intermittent heating for six days by an electric heater at a distance of about 27 in., while a slight tendency to the disorder was apparent in the fruit at a distance of 36 in. The fruit exposed to this treatment also exhibited various manifestations of heat injury. Similar results were obtained on less mature Winter Banana apples heated for only 48 hours, while in tests on Jonathans beginning on 13th August water-core developed after 24 hours' heating.

Biochemical studies conducted during the last five years indicate that some of the changes occurring in localized tissues and resulting in water-core are analogous to those associated with normal ripening, but they take place at a much more rapid rate. The moisture content of water-cored tissues was found to average about 20 per cent. higher than the normal. The affected tissues were further characterized, in the early stages of the disorder, by their rapid starch conversion and corresponding increase in soluble sugars. The osmotic concentration of the diseased tissues was found to be higher than that of healthy ones. Under certain conditions relatively large quantities of alcohol could be detected (0·1 to 0·8 per cent. by weight of fresh tissue in severely water-cored Delicious apples held at laboratory temperatures for a few days). There was a pronounced decrease of titratable acidity in water-cored as compared with healthy tissue. The evidence accumulated as a result of these studies indicates that water-core is a consequence of premature and unequal starch conversion, which may be induced by the effect of comparatively high temperatures on diastatic activity. The high soluble sugar concentrations developing from this hydrolysis apparently set up abnormal osmotic relationships, leading to the guttation of the affected tissues with water.

READ (F. M.). **Leaf scorch of fruit trees.**—*Journ. Dept. Agric. Victoria*, xxix, 8, pp. 386–387, 2 figs., 1931.

The author states that the 1930–31 vegetative season in Victoria has been marked by exceptionally wet conditions, which are considered to be responsible for the higher prevalence than in normal years of a leaf scorch of deciduous fruit trees, similar to that described by Wallace from England [*R.A.M.*, x, p. 802] and attributed by him to potash deficiency. The scorching develops as a browning and drying out of the margins of the leaves; in bad cases only a small area in the centre remains green, while the remainder is brown and shrivelled, giving the affected trees the appearance of having been severely scorched by fire. This condition was associated in Victoria with the three types of soil mentioned by Wallace, two of which tended to dry during hot spells while the third was water-

logged, but severe injury was also experienced in a locality in which the soil conditions [not further described] did not answer to any of these types. In the author's opinion, the excessive summer rains undoubtedly leached out much potash from the foliage, and thus accentuated the trouble.

It is recommended that, where leaf scorch is appreciable, fairly heavy doses of potash manures should be applied to the trees for three or four years consecutively, or until the trouble disappears. The dressing should be applied preferably towards the end of August each year. On experimental plots at Beaconsfield it was noticed that on trees that had received 3 lb. of sulphate of ammonia scorching was more severe than on those that had received the same dose of potash in addition to nitrogen, while on the plots receiving potash only scorching was practically absent. Clean cultivation had no beneficial effect and, in many instances, was a waste of time.

HARTMAN (H.). **A preliminary report on Anjou scald and its control.**— *Oregon Agric. Exper. Stat. Bull.* 280, 8 pp., 2 figs., 1931.

Anjou scald, the name applied by the writer to a brownish or dark discoloration developing in stored Anjou pears from the Rogue River Valley and elsewhere in Oregon, was first observed in 1928. It appears to be distinct from common pear scald [*R.A.M.*, ix, p. 789], which is characterized by sloughing of the skin and a foul odour of the fruit, both of which features are absent in the present trouble. Anjou scald occurs both in precooled and non-precooled fruit, in frozen pears, in those kept just above freezing point, and in fruit held for varying periods at 29°, 30°, and 31° F., or constantly at 32°. The eating quality of the pears is not materially impaired but their appearance is spoiled. Good control of the disease was obtained under experimental conditions by the use of (*a*) oiled-paper wraps containing 18·2 per cent. oil, and (*b*) copper-oil paper wraps containing 18·1 per cent. oil and 1·4 per cent. copper (equivalent to 5·5 per cent. copper sulphate), as used against *Botrytis* rot.

WORMALD (H.). **Bacterial diseases of stone-fruit trees in Britain. II. Bacterial shoot wilt of Plum trees.**—*Ann. of Appl. Biol.*, xvii, 4, pp. 725–744, 4 pl., 1930.

This is an extended account of the author's researches on the bacterial shoot wilt of plum trees, a preliminary notice of which has already been published [*R.A.M.*, viii, p. 182]. On grafted Victoria plums the disease causes flaccidity and drooping of the terminal leaves of the shoots, many of which show in the early stages of infection elliptical, sunken, dark spots, 2 to 3 mm. in length, with dark centres bordered by a paler zone encircled by a darker line. The lesion then extends, often for several inches, along the shoot. On some shoots the lesions are wholly unilateral and cause a recurving of the apex. Bacterial wilt differs from wither-tip (*Sclerotinia cinerea*) in the development of the lesions directly on the axis and not by extension from the leaves, the

greater length of the spots, and the presence of bacterial masses in the infected areas.

Inoculation experiments were conducted in the greenhouse and out of doors with different strains of the pathogen isolated from naturally and artificially infected shoots. Positive results were obtained on the buds, leaves, fruit, shoots, twigs, and branches of plum trees, but infection developed only round wounds, except in one case where spotting was induced by spraying the leaves with a bacterial suspension. Inoculations on the woody parts usually gave rise to exudations of gum, a fact which suggests that the bacterial wilt organism is a contributory cause of gummosis.

The plum-wilt pathogen, for which the name *Pseudomonas prunicola* is proposed (or *Phytomonas prunicola* if the classification of the Society of American Bacteriologists [ibid., iii, p. 18] is adopted), is a rod with rounded ends measuring 0·9 to 2·5 by 0·3 to 0·5 μ, staining most deeply with methyl violet, carbol fuchsin, gentian violet, and aniline gentian violet, and less vividly with methylene blue, Bismarck brown, and Gram's stain. One, two, or three polar flagella are present. The optimum temperature for the development of the organism appears to be about 25° C. and the thermal death point is 46°. The cultural characters of the plum pathogen on a number of standard media are fully described. When growing in mass on agar slopes or plates the colonies are greyish- or yellowish-white, while on sterilized potato plugs the yellowish tinge is more evident. The organism must, however, be classified among the white organisms, its yellow tint being of a different order from that of the true yellow bacteria, e.g., *Pseudomonas* [*Bacterium*] *pruni*. The plum wilt organism is further briefly compared with, and differentiated from, *Bacillus amylovorus*, *B. spongiosus* [ibid., vii, p. 177], and *P. cerasi* [ibid., iv, p. 488; cf. v, p. 538]. *P. prunicola* liquefies gelatine and coagulates milk, but does not reduce nitrates to nitrites. Its group number is 211·2322033, and its index number according to the description chart of the Society of American Bacteriologists, 5021–31100–0202.

Balakhonoff (P. I.). К вопросу о сильном развитии монилиального „ожога" цветов косточковых на Северном Кавказе. [The problem of the severe development of *Monilia* 'scorch' of the blossoms of stone fruit trees in North Caucasus.]—*Materials for Mycol. and Phytopath.*, Leningrad, viii, 2, pp. 137–139, 1931.

The author states that the severe killing of the blossoms of stone-fruit trees which regularly recurs every year in North Caucasus to such a degree as to render fruit growing unremunerative is almost exclusively due to the highly neglected condition of the local orchards, in which *Sclerotinia cinerea* [*R.A.M.*, x, p. 605] is practically omnipresent. The damage done by this fungus can only be stopped by the usual measures directed towards its suppression, especially during the spring, when the relatively cool and humid conditions favour its luxuriant development. The absence of the fruit rot caused by *S. cinerea* from that region is explained by the weather conditions during the latter part of the season.

Brooks (F. T.) & Brenchley (G. H.). **Silver-leaf disease. VI.** —*Journ. Pomol. and Hort. Science*, ix, 1, pp. 1–29, 2 figs., 1931.

Further investigations into silver leaf disease (*Stereum purpureum*) [*R.A.M.*, x, p. 605], with special reference to its incidence in plum stocks and young nursery trees, showed that the invasion of wounds by the fungus was most satisfactorily prevented by applications of soft grafting wax and home-made white lead paint. Considerable differences in susceptibility to the disease were shown by various derivatives of 'selfed' Victoria plums; inoculation experiments on Victoria plum trees worked on different stocks indicated that the influence of the stock on susceptibility is slight and probably only indirect.

The term 'gum barriers' [ibid., v, p. 502] is now extended to include certain normal reactions of the host below wounds uninvaded by parasitic fungi; these barriers usually develop within an inch of the wound, and require at least two months for their completion. Their formation [which is described] is essentially the same whether *S. purpureum* is present or not, though when the fungus is active they may develop much lower down and more slowly.

Further tests of manurial treatments indicated that no special treatment can be recommended invariably as likely to facilitate recovery. Anything, however, which increases the vigour of affected trees is likely to assist their recovery; in the experiments described phosphatic and potassic manures gave the most beneficial results.

Silvered plum suckers, in which the mycelium of *S. purpureum* was not present, sometimes retained the silvering symptoms up to two years after their separation from the parent trees. In many diseased young worked trees, the fungus had entered through one or other of the wounds made in cutting back the stem of the stock in the process of propagation. The bearing of these investigations on nursery practice is discussed.

In conclusion, it is stated that if a tree does not die during the first few years of infection, its chances of recovery are good. Hot, dry summers assist recovery. The greatest danger of widespread infection occurs when heavy cropping has caused the branches to break, especially if a wet autumn follows.

Natalyina (Mme O.). **Polystigmella ussuriensis nov. gen. et sp.**—*Materials for Mycol. and Phytopath.*, Leningrad, viii, 2, pp. 161–164, 2 figs., 1931.

The author states that in 1928, on overwintered leaves of the local plum *Prunus triflora* var. *coreana* in the neighbourhood of Vladivostock, she found the ascogenous stage of the imperfect pycnidial fungus *Rhodoseptoria ussuriensis* observed in 1912 by Naoumoff (*Bull. Soc. Myc. de France*, xxix, 1913) on the same host, on which it causes a very serious disease of the leaves and fruits, popularly known under the name 'krasnoukha' [measles]. The perfect form is most closely allied to the genus *Polystigma* de Candolle, from which it differs, however, in certain morphological and biological details; it is therefore referred to a new genus

which is named *Polystigmella*, and the name *P. ussuriensis* is suggested for it. The stroma of the perithecial form occupies the whole thickness of the leaf; it is firm, concave on the upper and convex on the under side of the leaf, sharply delimited, rounded, superficially brown, from 1 to 8 mm. in diameter by 280 to 300 μ thick, and with black specks on the under side. The stromata contain numerous applanate loculi (perithecia), 190 to 200 by 150 to 180 μ in diameter, with pigmented ostioles opening on the under surface of the leaves. The asci are hyaline, narrowly club-shaped, on a long, bent pedicel with a thickened heel, and measure 85 to 90 by 10 to 11 μ. Paraphyses are not present. The ascospores are hyaline, two-celled, narrow ellipsoidal, with a transverse septum in the middle, mono- or distichous (eight to each ascus), and measure 8 to 11 by 3 to 5 μ. Russian diagnoses of the new genus and new species are appended.

Togashi (K.). **Studies on the pathology of Peach canker.**—*Bull. Imper. Coll. Agric. & Forestry*, Morioka, Japan, xvi, 178 pp., 2 pl., 5 figs., 29 graphs, 1931.

This is a comprehensive discussion, accompanied by 75 tables, of the writer's investigations, dating from 1926, on peach canker in Japan, where the disease is caused by *Leucostoma persoonii* (Nitsch.) comb. nov. (*L. leucostoma* (Pers.) Togashi) and *Valsa japonica* [*R.A.M.*, x, p. 41].

The peach strain of *L. persoonii* was found to be capable of infecting plum, apricot, cherry, and nectarine, while the peach strain of *V. japonica* is pathogenic to peach, cherry, *Prunus mume*, apricot, and nectarine. Generally speaking, the mycelium of these fungi does not reach the xylem, probably owing to the obstructive action of gummy deposits. The formation of wound periderm and callus tissue is much less extensive at the upper and lower edges of the affected area than at the sides. From such unprotected zones the overwintered mycelium invades the adjoining healthy tissues in the spring, so that another canker develops round the margins of that formed the previous year.

The formation of the gum barrier occurs in the embryonic woody tissues immediately after infection by *L. persoonii* and *V. japonica*. Both fungi secrete diastase, invertase, maltase, emulsin, hemicellulase, pectinase, and cellulase, the enzymes of *L. persoonii* being generally more active than those of *V. japonica*. The optimum temperature range for enzymatic activity in *L. persoonii* was found to be 30° to 40° C. and in *V. japonica* 25° to 40°. The process of gummification is believed to be accelerated by the enzymes.

Particulars are given concerning the fluctuations of temperature in the tissues of the north and south sides of peach branches, and of the differences between the temperature of the air and that of the branches. It may be inferred from the data that the tissues on the south side are less resistant to low temperatures than those on the north, this probably being the explanation of the frequent occurrence of sun scald on the southern sides of peach branches. The optimum temperatures for the development of *L. persoonii* are 5° or more higher than those favouring the growth of *V. ja-*

ponica. The former organism, therefore, is more in evidence during warm weather, while the latter assumes a greater relative importance with the onset of colder conditions. *L. persoonii* is widely distributed all over Japan, while *V. japonica* is restricted to the northern part of Honshu and Hokkaido. Some comparative inoculation tests were carried out with a strain of *L. persoonii* and a species of *Cytospora*, both isolated from plum branches in England by Nattrass. The former proved to be a weaker peach parasite than the Japanese strain on the varieties tested, and failed to infect the plum varieties on which it was tried. The *Cytospora* was not parasitic on either host in the author's tests.

The protective reaction of gumming and the healing processes of wound periderm and callus formation were found to depend entirely on the state of growth of the tree and the season of infection. Healing takes place rapidly during the active growth of the trees, which reaches its climax at the end of June.

HARRIS (R. V.). **Notes on diseases of the Raspberry, Loganberry and Blackberry in 1928-1930.**—*Ann. Rept. East Malling Res. Stat. 1928, 1929, and 1930, II Supplement*, pp. 133–139, 1931.

Notes are given on the following diseases of *Rubus* spp. observed at East Malling during the period 1928 to 1930, inclusive: blue stripe wilt (*Verticillium dahliae*) [*R.A.M.*, viii, p. 183], cane spot (*Plectodiscella veneta*) [loc. cit.], spur blight (*Leptosphaeria coniothyrium*) [ibid., ix, pp. 117, 535], *Botrytis* rot (*B. cinerea*), black blotch (*? Cryptosporium minimum*) [ibid., viii, p. 546], *Microthyriella rubi* [loc. cit.], and black root (apparently due to unfavourable soil conditions) of raspberries; cane spot (*P. veneta*) and spur blight (*Didymella applanata*) [ibid., ix, p. 663] of loganberries [*Rubus loganobaccus*]; and *Septoria* spot (*? S. rubi*), rust (*Phragmidium violaceum*) [ibid., iii, p. 428], and purple blotch of blackberries, the last disease being apparently caused by a species of *Septoria* differing from *S. rubi*.

With regard to the raspberry black blotch the author states that in July, 1928, specimen canes received from Leeds were found to be covered with superficial black spots and blotches. *C. minimum* was isolated from the spots and preliminary inoculations indicated that it is weakly parasitic. Later in the year and again in 1930 further similarly infected canes were received from Middlesex and Somerset. There was no evidence that the disease seriously damaged the canes.

SMITH (F. E. V.). **The Banana industry in Portland.**—*Jamaica Gaz.*, liv, 34, pp. 703–704, 1931.

In a letter dated 15th May, 1931, addressed to the Director of Agriculture, the Government Microbiologist reports that both on a recent visit to the Portland banana-growing district of Jamaica, and on a previous visit four months earlier, he was impressed by the rapid degeneration in the banana industry, especially near the coast and within a radius of about eight miles from Port Antonio. Panama disease [*Fusarium cubense*: see above, p. 25] is stated

TOMKINS (R. G.). **Vaseline and the growth of moulds.**—*Dept. Sci. & Indus. Res. Rept. Food Invest. Board for the year 1930*, pp. 68–69, 1931.

Further tests made of the vaseline smearing method of preventing fungal invasion of the cut stalks of fruits and vegetables [*R.A.M.*, ix, p. 729] demonstrated that vaseline has no antiseptic properties, that the rate of lateral fungal spread on an agar surface beneath a continuous film of vaseline is not less rapid than on an uncovered surface, though the amount of mycelium formed is much less, and that strongly growing mycelium can penetrate vaseline barriers in every direction. The effectiveness of vaseline as a preventive of stalk rot appears to depend on the inability of the spores to reach the surface and their failure to germinate owing to lack of direct contact with the surface of the nutrient, and also on the reduction in the initial amounts of mycelium formed whenever germination does occur.

TOMKINS (R. G.). **Volatile substances and the growth of moulds.** —*Dept. Sci. & Indus. Res. Rept. Food Invest. Board for the year 1930*, pp. 48–55, 6 graphs, 1931.

Investigations [the results of which are expressed graphically and discussed] into the effect of acetaldehyde upon the growth of *Trichoderma lignorum* [cf. *R.A.M.*, ix, p. 659] showed that the presence of small quantities of acetaldehyde in the atmosphere decreased the rate of growth. The greater the concentration of the acetaldehyde the more was growth retarded, but the rate of growth at any given concentration increased with time, the relative retarding effect of the acetaldehyde being greater in the earlier than in the later phases of growth. When normally growing cultures of *T. lignorum* were introduced into an atmosphere containing acetaldehyde, the rate of growth was immediately checked. Fungal growth was possible in concentrations of acetaldehyde which inhibited germination; the larger the colony the less was the inhibiting effect of a given concentration.

Moulds [unspecified] were able to grow in atmospheres in contact with watery solutions of chloroform if these solutions were not stronger than 5 parts in 10,000 by volume. The presence of chloroform retarded the rate of spread, which remained constant for any given concentration. The rate at which a colony spread when introduced into any given concentration of chloroform was also constant and uninfluenced by the size of the colony.

Ethyl ether, ethyl alcohol, and esters all reduced the rate of growth of moulds. Butyraldehyde retarded growth similarly to acetaldehyde, in so far as germination at a definite concentration was followed by a phase in which there was an increasing rate of growth. The action of formaldehyde, however, was quite distinct from that of other aldehydes, fungal growth continuing at a constant rate in the presence of concentrations which allowed germination.

Volatile substances retarding and inhibiting the growth of moulds appear, thus, to fall into two broad groups, viz., those which when present in definite concentrations retard growth to a constant value, irrespective of the age of the culture and the

duration of exposure, and, secondly, those in whose presence there is a certain measure of adaptation and a consequent increase in the rate of growth with the length of exposure.

DODONOFF (B. A.). К методике полевого испытания инсекто-фунгицидов. [On the methods of testing insecticides and fungicides in the field.]—*Plant Protection*, Leningrad, viii, 2, pp. 135–148, 3 graphs, 1931. [English summary.]

The author states that in his opinion much of the scientific and practical value of the work hitherto done in testing the efficacy of insecticides and fungicides is vitiated by the lack of uniformity in the methods employed, which precludes the possibility of checking the results of one worker against those obtained by others. This paper represents an effort to arrive at a standardization of the methods used in field tests, two types of which are considered, namely, those on a small scale, which are comparable with laboratory experiments, and those on a large scale, serving to check the results obtained in the first. Emphasis is first laid on the necessity of using more or less uniform dusting or spraying apparatus, since so much of the results depends on their working and on the rate of application of the preparations. Exact formulae are worked out for the estimation of the quantities of dusts and sprays applied, the factors of which include the discharge of the preparation from the nozzles in grams per minute, the width of the dust cloud or spray jet discharged, the dose of the poisonous substance in the dust or spray, and the speed with which the apparatus is moved in metres per minute. It is pointed out that the speed of motion depends on the nature of the crop treated, and that it is important to arrive at a definite average speed in order to render the tests comparable. Mention is made of a dusting apparatus which has recently been constructed and put on the market under the name 'Vek' by the Moscow Branch of the Plant Protection Institute, and which is stated to have given satisfactory results.

VERHOEVEN (W. B. L.). **De ontsmetting van het zaaizaad in den landbouw.** [Seed disinfection in agricultural practice.]—*Tijdschr. over Plantenziekten*, xxxvii, 8, pp. 153–160, 1931.

From the 1,100 replies elicited by a recent questionnaire circulated by the Dutch Plant Protection Service in co-operation with various agricultural societies and individuals, it appears that the disinfection of wheat seed-grain, flax, and sugar beet is now fairly general in all parts of Holland. Less attention is paid to barley, rye, and oats, although in the province of Groningen some progress has been made in this direction. The treatment is usually carried out with an apparatus of the Puk type. Germisan, as officially recommended, was found to be extensively used, but on a number of farms copper sulphate is still employed, and in many cases the methods of treatment are very faulty. Some general observations are made on various aspects of seed disinfection, with special reference to treatment in certain recognized centres whence the seed is distributed to the farmers.